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# **The Northern Road Upgrade Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park**

NSW Environmental Impact Statement /  
Commonwealth Draft Environmental Impact Statement

## **Appendix N – Technical working paper: Non- Aboriginal heritage**

June 2017





# The Northern Road Upgrade – Mersey Road to Glenmore Parkway

Prepared for Roads and Maritime Services by Jacobs Australia

Non-Aboriginal Heritage Assessment

Final

15 May 2017



## The Northern Road Upgrade (Mersey Road to Glenmore Parkway)

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 Project manager: Kelly Thomas  
 Authors: Jennifer Chandler and Sally Waller  
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Jacobs Group (Australia) Pty Limited  
 ABN 37 001 024 095  
 Floor 11, 452 Flinders Street  
 Melbourne VIC 3000  
 PO Box 312, Flinders Lane  
 Melbourne VIC 8009 Australia  
 T +61 3 8668 3000  
 F +61 3 8668 3001  
 www.jacobs.com

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## Abbreviations

AHC Act	<i>Australian Heritage Council Act 2003</i>
CHL	Commonwealth Heritage List
CHP	Commonwealth Heritage Place
CPWSGTF	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
DoEE	Department of Environment and Energy
DEOH	Defence Establishment Orchard Hills
DP&E	NSW Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	<i>Environment Planning and Assessment Act 1979</i>
EPBC Act	<i>Environmental Protection and Biodiversity Act 1999</i>
Heritage Act	Heritage Act (NSW) 1977
HMP	Heritage Management Plan
ICOMOS	International Council on Monuments and Sites
Jacobs	Jacobs Group (Australia) Pty Ltd
LEP	Local Environment Plan
LLEP	Liverpool Local Environment Plan
NHL	National Heritage List
NMHMA	<i>Newcastle Morning Herald and Miners' Advocate</i>
NSW	New South Wales
NT	<i>Nepean Times</i>
OEH	Office of Environment and Heritage
PLEP	<i>Penrith Local Environmental Plan 2010</i>
REF	Review of Environmental Factors
REFCF	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
RNE	Register of the National Estate
Roads and Maritime	Roads and Maritime Services
RAAF	Royal Australian Air Force

RAN	Royal Australian Navy
SEARs	Secretary's Environmental Assessment Requirements
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities
SHR	State Heritage Register
SMH	<i>Sydney Morning Herald</i>
TSC Act	<i>Threatened Species Conservation Act 1995</i>

## Executive Summary

### Introduction

This document presents the results of a non-Aboriginal heritage assessment for the Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park (the project).

Roads and Maritime is seeking approval to upgrade 16km of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park (the project). The project generally comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction). The wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and about 100 m south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham, to realign the section of The Northern Road that currently bisects the Western Sydney Airport site and to bypasses Luddenham
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and about 100 m south of Glenmore Parkway, Glenmore Park
- Closure of the existing The Northern Road through the Western Sydney Airport site
- Tie-in works with the following projects:
  - The Northern Road Upgrade, between Peter Brock Drive, Oran Park and Mersey Road, Bringelly (to the south)
  - The Northern Road Upgrade, between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith (to the north)
- New intersections including:
  - A traffic light intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport, incorporating a dedicated u-turn facility on the western side
  - A traffic light intersection for service vehicles accessing the Western Sydney Airport, incorporating 160 m of new road connecting to the planned airport boundary
  - A traffic light intersection connecting the realigned The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham
  - A 'give way' controlled intersection (that is, no traffic lights) connecting the realigned The Northern Road with Eaton Road (east of the new alignment, left in, left out only)
  - A four-way traffic light intersection formed from the realigned Elizabeth Drive, the realigned The Northern Road and the existing The Northern Road, north of Luddenham
  - A traffic light intersection at the Defence Establishment Orchard Hills entrance, incorporating a u-turn facility
- New traffic lights at four existing intersections:
  - Littlefields Road, Luddenham
  - Kings Hill Road, Mulgoa
  - Chain-O-Ponds Road, Mulgoa
  - Bradley Street, Glenmore Park incorporating a u-turn facility
- Modified intersection arrangements at:
  - Dwyer Road, Bringelly (left in, left out only)



- Existing Elizabeth Drive, Luddenham (left out only)
- Gates Road, Luddenham (left in only)
- Longview Road, Luddenham (left in, left out only)
- Grover Crescent south, Mulgoa (left in only)
- Grover Crescent north, Mulgoa (left out only)
- Dedicated u-turn facilities at:
  - The existing The Northern Road at Luddenham, south-west of Elizabeth Drive
  - The existing Elizabeth Drive, Luddenham around 800 m east of The Northern Road
  - Chain-O-Ponds Road, Mulgoa
- Twin bridges over Adams Road, Luddenham
- Local road changes and upgrades, including:
  - Closure of Vicar Park Lane, east of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, west of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, east of the realigned The Northern Road, Luddenham
  - Elizabeth Drive cul-de-sac, about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive, Luddenham
  - Extension of Littlefields Road, east of The Northern Road, Mulgoa
  - A new roundabout on the Littlefields Road extension, Mulgoa
  - A new service road between the Littlefields Road roundabout and Gates Road, including a 'give way' controlled intersection (that is, no traffic lights) at Gates Road, Luddenham
  - Extension of Vineyard Road, Mulgoa between Longview Road and Kings Hill Road
  - A new roundabout on the Vineyard Road extension at Kings Hill Road, Mulgoa
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required
- The upgrading of drainage infrastructure
- Operational ancillary facilities including:
  - Heavy vehicle inspection bays for both northbound and southbound traffic, adjacent to Grover Crescent, Mulgoa and Longview Road, Mulgoa respectively
  - An incident response facility on the south-western corner of the proposed four-way traffic light intersection at Elizabeth Drive, Luddenham
- New traffic management facilities including variable message signs (VMS)
- Roadside furniture and street lighting
- The relocation of utilities and services
- Changes to property access along The Northern Road (generally left in, left out only)
- Establishment and use of temporary ancillary facilities and access tracks during construction
- Property adjustments as required
- Clearance of undetonated explosive ordinance (UXO) within the Defence Establishment Orchard Hills as required.

The project assessed in this EIS does not include surveys, test drilling, test excavations, geotechnical investigations or other tests, surveys, sampling or investigation for the purposes of the design or assessment of the project.

Jacobs Group (Australia) Pty Ltd (Jacobs) was commissioned by Roads and Maritime Services (Roads and Maritime) to undertake an assessment of the potential environmental impacts of the project, and prepare an Environmental Impact Statement (EIS) in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) that adequately addresses the requirements of those Acts.

As part of preparing the EIS, this non-Aboriginal heritage impact assessment identifies the non-Aboriginal heritage items within and immediately adjacent to the project (ie the study area), assesses the potential impacts on the heritage items from the proposed project activities, and develops measures to address impacts. The non-Aboriginal heritage impact assessment addresses archaeology, heritage items and conservation areas, in accordance with NSW Heritage Branch guidelines, and the Australia ICOMOS Charter for Places of Cultural Significance (Burra Charter).

For proposed actions situated on Commonwealth land or which may impact on Commonwealth land, the guidelines *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* (*Significant Impact Guidelines 1.2*) have been applied.

## Desktop assessment and field survey

A review of previous heritage studies for the study area and a search of relevant heritage registers was undertaken. There are two registered heritage items within the construction footprint - Lawson's Inn site is listed on the Liverpool Local Environmental Plan (LLEP), and Orchard Hills Cumberland Plain Woodland is listed on the Commonwealth Heritage List (CHL). The CHL listing includes natural heritage values as well as historic heritage values with reference to evidence of canals associated with the Chaffey Brothers irrigation scheme.

The Heritage Management Plan (HMP) (Godden Mackay Logan 2013) for the Defence Establishment at Orchard Hills (DEOH) incorporates the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP). This report includes an assessment of the heritage significance the site and its tolerance for change.

Another previous heritage assessment identified two heritage items previously nominated for inclusion on the Penrith Local Environmental Plan (PLEP) (The Northern Road, and the Warragamba Dam to Prospect Reservoir pipeline (otherwise referred to within the EIS as the WaterNSW supply pipelines) and two previously nominated heritage items relating to rural landscape in the west of the Orchard Hills locality and along The Northern Road (Orchard Hills Rural landscape (area) – OH-01 and Orchard Hills Rural landscape (roadside) – OH-04). All four heritage items were nominated for inclusion on the PLEP, but were subsequently not listed. One heritage item, The Northern Road alignment, identified in a previous report is located immediately adjacent to the construction footprint. There is the potential for previously unidentified historical heritage items to be situated in the study area, based on the review of aerial imagery, and the relatively limited nature of previous heritage assessments in the study area.

Based on the desktop assessment, the following types of historical heritage items may be found in the study area:

- Houses, homesteads and other buildings associated with the settlement of the region
- Past rural uses related to agriculture and orcharding, including stockyards, fences, sheds and outbuildings, orchard trees, and wells.

A historical heritage field survey was undertaken on 22-23 February 2016 and 5-6 April 2016 by Amanda Goldfarb (Project Archaeologist, Jacobs) and Jennifer Chandler (Project Archaeologist, Jacobs). Priority areas for survey were identified using background information including aerial images, the predictive statement for historical site types, previous studies and field surveys, and historical heritage register listings. Six

known/registered historical heritage items were inspected during the field survey. A further four previously unidentified potential historical heritage items were identified during the survey.

Subsequent to the historical heritage field surveys in February and April 2016, the construction footprint was revised adding new areas for historical heritage assessment. A desktop assessment of these new areas, including review of aerial imagery, background information and consideration of field results from other areas already assessed in the vicinity was undertaken. No areas were identified as having potential for previously unidentified historical heritage items during the desktop assessment. Two new study areas were situated within the heritage boundary of the Warragamba Dam to Prospect Reservoir pipeline. These two new areas were surveyed together with an additional two new areas associated with drainage works at the pipeline site. The survey results are included in **Section 4.3**.

No field surveys were conducted in assessing potential impacts to natural heritage values. Rather, field-based information identified in the Biodiversity Assessment Report for this EIS (Appendix I of the EIS) as well as the Heritage Management Plan for the DEOH site was interpreted from a natural heritage perspective.

## Significance assessment

None of the previously unidentified potential historical heritage items have been found to have historical heritage significance. The significance assessment of the known/registered natural and historical heritage items has been reviewed and updated.

**Table 1** summarises the significance of each of the heritage items. Statements of Heritage Impact are provided for each of the four historical heritage items in **Section 5**.

Table 1 : List of known and potential heritage items within and immediately adjacent to the project

Heritage item number	Source	Heritage item name	Significance
Item 1	Artefact Heritage (2015)	Remnants of The Northern Road	None
Item 2	CHL, RNE	Orchard Hills Cumberland Plain Woodland	Commonwealth
Item 3	Penrith Heritage Study (Paul Davies Pty Ltd 2007)	Warragamba Dam to Prospect Reservoir pipeline	Local
Item 4	NA	Fruit Orchard, Luddenham	None
Item 5	NA	Weatherboard House, Slab Hut and Old Dairy, Luddenham	None
Item 6	NA	Weatherboard House and Sheds, Luddenham	None
Item 7	NA	"Pleasantview' House 1, Luddenham	None
Item 8	Artefact Heritage (2015)	'Luddenham Village' area: Chapel and School Site and Adams Road House	None
Item 9	Artefact Heritage (2015)	Miss Lawson's Guesthouse Site, Luddenham	Local
Item 10	Liverpool LEP	Lawson's Inn Site	Local

## Impact assessment

The proposed activities within or adjacent to each heritage item identified for this assessment and the potential impacts of these activities on heritage is presented in **Table 2**.

Table 2: Potential impacts from proposed works for each heritage item

Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
Item 2	Orchard Hills Cumberland Plain Woodland	105317 (CHL) 102211 (RNE)	Clearing of vegetation and construction of carriageway and associated fill slope as well as associated drainage and flood retardation works	<p>Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values of the site through native vegetation removal and associated habitat loss, as well as impacts to the historic heritage values of the site as a result of impacts to the Chaffey Brothers Irrigation Scheme Canal (the canal). These potential impacts are summarised below.</p> <p>The main impacts to natural heritage are as a result of clearing of around 9.68 ha of native vegetation within the western periphery of the CHP (Sectors B and H). However this is equivalent to only around 1.3% of the total 726.32 ha of native vegetation within the CHP. The majority of these areas are made up of a mix of regrowth natural vegetation communities identified in the HMP for the DEOH as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). There is also a small patch of relic native trees associated with two trees located within the north-western portion of the CHP that would also be impacted by the project. This area is identified as having moderate natural heritage significance (Godden Mackay Logan 2013). Of the impacted areas, none are identified as remnant vegetation communities which are ranked as high natural heritage significance in the HMP.</p> <p>The regrowth natural vegetation communities have been identified as having a reasonable tolerance for change, being that this element and its key attributes have relatively little heritage value, but may contribute to the overall significance of the site. In general, the element can be altered to a reasonable degree provided it does not impact the heritage values of the site (Godden Mackay Logan 2013). In the context of the CHP overall, impacts to regrowth natural vegetation communities as well as grasslands are expected to be minimal and are therefore considered reasonable. Given this and the moderate to low heritage significance of these elements, impacts as a result of the project are not expected to be significant.</p> <p>Relic native trees have been identified as having a low tolerance for change,</p>



Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
				<p>being that this element and its key attributes embody heritage values, retaining a high degree of intactness with no major change or alterations, or only minor alterations that do not detract from the heritage values. In general, the element should be retained and conserved (Godden Mackay Logan 2013). Although impacts to relic native trees in the overall context of the CHP as a result of the project would be minimal, given their moderate natural heritage significance and low tolerance for change, impacts to this element as a result of the project are considered moderate.</p> <p>The aquatic environment within the CHP that is ranked in the HMP as being of moderate to high significance (Godden Mackay Logan 2013) is not expected to be impacted by the project due to the distance from the works and the proposed application of effective mitigation measures.</p> <p>Potential impacts to the historic heritage values of this item are related to impacts to the canal located within the south-western portion of the CHP (Sector H of the DEOH). The canal is ranked as high significance in the HMP (Godden Mackay Logan 2013). Construction would overlap with only 2.43% of the northern part of the canal, some of which is in poor condition as it is extremely shallow from erosion. The canal and the area in which is situated (Sector H) has a low tolerance for change in relation to new development and demolition/remediation. However, given the project is impacting a small proportion of the overall canal on DEOH land, and that the section being impacted is of relatively poor quality due to erosion, the overall impact on the historic heritage values are not considered to be significant.</p> <p>Vibration is unlikely to impact the canal due to the structural nature of the canal and vegetation on the canal.</p>
Item 3	Warragamba Dam to Prospect Reservoir pipeline	-	Construction of carriageway and fill slope. Drainage infrastructure upgrades comprising a concrete drainage channel along the northern perimeter of the Water NSW Precinct (north of the pipeline) and an access track to the east of The Northern Road.	<p>The Northern Road carriageway construction is confined to section of pipeline that is underground. No impact is expected.</p> <p>Proposed access track would impact on culvert located in Survey Area No. 4-26, but not on pipeline, as it is below the ground in this area.</p> <p>Proposed drainage works to the south of the pipeline would impact on culvert located in Survey Area No. 4-27.</p>

Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
			A second concrete drainage channel 500 m in length along the southern perimeter of the 1940s pipeline, to the east of The Northern Road.	While there is a physical impact on the culvert, there is not impact on heritage significance.
Item 9	Miss Lawson's Guesthouse Site	-	Construction of dual carriageway, intersection and cut slopes	The full site would be directly impacted by construction
Item 10	Lawson's Inn site	53 (LLEP)	Construction of dual carriageway, a cul-de-sac, an intersection, cut slopes and construction compound and laydown site	Around a quarter of the site would be directly impacted by construction

The implementation of the general and site-specific mitigation measures listed below would minimise impacts on non-Aboriginal heritage to an acceptable level to proceed with the project as assessed.

## Item 2: Orchard Hills Cumberland Plain Woodland (Lot 3 DP238092)

### Proposed works

Proposed works that would interact with the Orchard Hills Cumberland Plain Woodland CHP include clearing of vegetation and construction of a carriageway to the east of the existing The Northern Road, including associated fill slope formations and alterations to existing drainage lines for road-serving drainage and flood retardation works. This would have potential impacts on the natural heritage values of the site (refer to **Figure 7-1**). These works would also overlap with the western-most section of the Chaffey Brothers Irrigation Scheme Canal (the canal) in two locations, which would have potential impacts on the non-Aboriginal heritage values of the site (**Figure 7-2**).

### Impact Assessment

Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values of the site through native vegetation removal and associated habitat loss, as well as impacts to the historic heritage values of the site as a result of impacts to the Chaffey Brothers Irrigation Scheme Canal (the canal). These potential impacts are summarised below.

*The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:*

The natural heritage values of the site are mainly focused on its natural vegetation, which includes areas of original native vegetation (including very old relic trees) as well as the natural regrowth of these original plant communities (Godden Mackay Logan (2013)). This includes small remnants and regenerating areas of Cumberland Plain Woodland, Castlereagh Ironbark Forest and Sydney Coastal Riverflat Forest (River Flat Eucalypt Forest), particularly in the eastern portion of the CHP. It is noted that impacts from the project would be limited to the western periphery of the CHP.

Cumberland Plain Woodland is listed as a critically endangered ecological community at both state (*Cumberland Plain Woodland in the Sydney Basin Bioregion*) and Commonwealth levels (*Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*). As such, the CHP is considered a core biodiversity area for the conservation of these communities, and the place comprises the least disturbed and largest remaining remnant of Cumberland Plain Woodland (Godden Mackay Logan 2013).

Although around 9.68 ha of native vegetation would be removed by the project, this is equivalent to only around 1.3% of the 726.32 ha of native vegetation on the CHP. These areas are made up of a mix of regrowth natural vegetation communities identified in the HMP as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). There is also a small patch of relic native trees associated with two trees located within the north-western portion of the CHP that would also be impacted by the project. This area is identified as having moderate natural heritage significance (Godden Mackay Logan 2013).

Additionally of the 9.15 ha of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (CPWSGTF) and River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (REFCF) ecological communities that would be removed by the project, this would be equivalent to only around 1.5% of the total 610.60 ha of these communities within the CHP. None of the areas impacted by the project have been identified in the HMP as remnant vegetation communities of high natural heritage value.

Additionally since the area is already disturbed by fencing, roadside and edge effects, impacts to fauna within the CHP as a result of the project (eg edge effects, light pollution, etc.) are not considered to be significant. For impacts to fauna refer to the Biodiversity Assessment (Appendix I of the EIS).

The project would also result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour potential along these drainage lines would increase and ground conditions would become wetter. However, these impacts are not expected to extend to the aquatic areas mapped as moderate to high significance within the CHP, therefore the impact on these areas would be negligible. This is due to the distance of the works from these areas and the implementation of effective mitigation measures outlined in the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).

The entire length of the canal within the CHP is around 2,632 m and is ranked as being of high significance in the HMP (Godden Mackay Logan 2013). There would be minimal impact to the canal as much of its extent is situated outside the construction footprint. The construction footprint (and therefore, area of impact) only overlaps with around 2.43 % of the entire canal. Furthermore, around 36 m of the part of the canal located within the construction footprint is in poor condition as it is extremely shallow from erosion. The section within the construction footprint which is in better condition is very similar to those sections that are outside the construction footprint. The wooden features of the canal structure that have the potential to yield information about the construction of the canal are located outside the construction footprint.

*The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:*

As identified above, although around 9.68 ha of native vegetation would be removed by the project, this is equivalent to only around 1.3% of the 726.32 ha of native vegetation on the CHP and is mainly made up of a mix of regrowth natural vegetation communities identified in the HMP as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). The small patch of relic native trees within the north-western portion of the CHP that would also be impacted by the project, which has been identified as having moderate natural heritage significance (Godden Mackay Logan 2013).

The key attributes of natural heritage elements on DEOH are the floristics and structure of the ecological communities, and the existence of the isolated relic trees. Therefore, they have different levels of tolerance for change. The regrowth natural vegetation communities have been identified as having a reasonable tolerance for change, being that this element and its key attributes have relatively little heritage value, but may contribute to the overall significance of the site. In general, the element can be altered to a reasonable degree provided it does not impact the heritage values of the site (Godden Mackay Logan 2013). In the context of the CHP overall, impacts to regrowth natural vegetation communities as well as grasslands are expected to be minimal and are therefore considered reasonable. Given this and the moderate to low heritage significance of these elements, impacts as a result of the project are not expected to be significant.

Relic native trees have been identified as having a low tolerance for change, being that this element and its key attributes embody heritage values, retaining a high degree of intactness with no major change or alterations, or only minor alterations that do not detract from the heritage values. In general, the element should be retained and conserved (Godden Mackay Logan 2013). Although impacts to relic native trees in the overall context of the CHP as a result of the project would be minimal, given their moderate natural heritage significance and low tolerance for change, impacts to this element as a result of the project are considered moderate.

The project could potentially introduce invasive weed and pest species. There may be regular mobilisation of typical roadside maintenance fertilisers, herbicides or other chemicals that may stunt the regrowth of native vegetation. However this would be managed through the implementation of effective weed and pest management measures as outline in the Biodiversity Assessment (Appendix I of the EIS).

The project would result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour potential along these drainage lines would increase and ground conditions would become wetter. However as identified above, impacts to the aquatic areas mapped as moderate to high significance in the DEOH site would be negligible due to the distance of the works from these areas and the implementation of effective mitigation measures.



In relation to the canal, which is ranked as being of high significance in the HMP (Godden Mackay Logan 2013), only 2.43 % of the entire canal extent associated with the DEOH is situated within the construction footprint and would therefore be subject to direct physical impact during construction. The remaining sections of the canal within the study area would potentially be subject to damage or destruction from the use of construction machinery and vehicles if not managed appropriately during construction; however this is not expected given the implementation of mitigation measures as outlined in **Section 8.1**.

Around 36 m of the canal within the construction footprint area is extremely shallow and eroded while the more intact section is similar to the other sections which would not be impacted, therefore it has limited potential to yield information just from that section. Overall the proposed works would have minimal impact to the significance of the site.

Furthermore, there are other remnants of the canal located to the west of The Northern Road about one kilometre south-west of the DEOH site which is listed on the PLEP as a locally significant archaeological heritage item (A-137).

The Heritage Management Plan for the DEOH site (Godden Mackay Logan 2013:152-155) outlines management guidelines for the DEOH, including those related to managing impacts to the natural heritage values within Sectors B and H and historic heritage values associated with the canal in Sector H as follows:

- This New development in Sectors B and H should be located so as to avoid impacts on natural heritage. These sectors have a low tolerance for change in relation to new development
- New development in Sector H should not be planned for the southwest area where the Mulgoa Irrigation Scheme (the canal) is located. This southwest area of Sector H has a low tolerance for change in relation to new development.
- Demolition and remediation relating to whole of DEOH land – Remediation should aim to avoid all heritage items and values. If heritage sites cannot be avoided as a consequence of remediation, then heritage mitigation measures should be implemented. Remediation that impacts heritage values must be subject to assessment, development of a HIA, heritage impact mitigation and Defence approval.
- Demolition and remediation relating to Sector H (location of canal) - consideration of proposals for demolition of built elements should take into account the heritage value of the element and its tolerance for change, as well as its relationship to other, related elements of heritage value and the number of its type remaining. Demolition of elements of moderate and high heritage value should be avoided. Sector H has a low tolerance for change.

As discussed above, some impacts would occur as a result of the project which are unavoidable. Additionally, given the project is impacting a small proportion of the overall canal on DEOH land, and that the section being impacted is of relatively poor quality due to erosion, the overall impact on the heritage values are not considered to be significant.

However by implementing the relevant mitigation measures identified in the Biodiversity Assessment (Appendix I of the EIS), the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS), impacts to the natural heritage values of the site are expected to be minimised and are not expected to be significant.

By implementing the following mitigation measures the potential impacts on the canal would be minimised:

- An archival photographic recording would be made of the extent of the canal to be impacted by the works, in accordance with the Heritage Division of the OEH guidelines (Heritage Council of NSW 2006) prior to its demolition
- The section of the canal outside the construction footprint would need to be protected from accidental or incidental damage during construction. Protective barrier fencing would be constructed along the construction footprint boundary in the vicinity of the canal prior to construction commencing and would remain in place until the conclusion of the works, at which time it would be removed.

Implementing these mitigation measures would reduce the impact of the significance of the canal as much as possible given the other constraints in this area of the project.

Impacts for this item have also been assessed against the Significant Impact Guidelines 1.2 (Department of Sustainability Environment Water Population and Communities 2013) (SEWPaC) (refer to **Section 7**).

In summary, the project is not expected to have a significant impact on the natural or non-Aboriginal heritage values of the CHP given the heritage significance of these elements, their tolerance for change and proposed implementation of effective mitigation measures in accordance with this assessment (Section 8.1), the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).

### **Item 3: Warragamba Dam to Prospect Reservoir pipeline (Lot A DP341629 & Lot A DP341893)**

#### **Proposed works**

Construction of carriageway and fill slope to the west of The Northern Road (current) overlaps with the pipeline alignment to the west of The Northern Road.

#### **Impact assessment**

*The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:*

The proposed carriageway would be located over the section of pipeline that is below the ground to the west of The Northern Road and would avoid direct impact to the pipeline. In addition the proposed works include fill slopes within the pipeline corridor.

*The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:*

Potential for physical damage to the pipeline from road construction machinery, vehicles or other activities accidentally occurring outside the construction footprint. However, measures outlined in The Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines (Sydney Catchment Authority 2012) sets out guidelines when designing, planning or assessing development on land adjacent to this pipeline. The document outlines risks to the pipeline through construction works in the vicinity. A Construction Environmental Management Plan is recommended for major development projects (Sydney Catchment Authority 2012:9).

The two concrete culverts located within a proposed access track and drainage works area would be directly impacted by the proposed works. However, removal of the culverts would not impact on the significance of the pipeline.

### **Item 9: Miss Lawson's Guesthouse site (Lot 1 DP90157)**

#### **Proposed works**

- Construction of dual carriageway and cut slopes
- Construction of an intersection off the new The Northern Road onto Eaton Road.

#### **Impact assessment**

*The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:*

While the project would have a direct impact on archaeological deposits of the Guesthouse site, the opportunity for undertaking a detailed archaeological investigation of the site prior to its destruction may enhance its significance through the realisation of its research potential. Undertaking archaeological investigation of the site under a well-structured research design by an appropriately qualified historical archaeologist would reveal information and answer questions particularly in relation to the early settlement of Luddenham and the hotel and inn industry in the early 20<sup>th</sup> century.

*The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:*

The construction of The Northern Road upgrade would have a direct impact on all surface features identified at the site, and on potential subsurface archaeological deposits from the construction. To minimise impacts and maximise the opportunity for realising research potential at the site the following actions would be undertaken:

- Salvage excavation to be undertaken in accordance with the Heritage Division of OEH guidelines including an appropriate research design and methodology in order to best realise the research potential of this area of the site
- Salvage excavation would be undertaken under the supervision of an appropriately qualified and experienced historical archaeologist in accordance with the Heritage Division of OEH criteria.

#### **Item 10: Lawson's Inn Site (Lot 2 DP623457) (LLEP 53)**

##### **Proposed works**

- Construction of a cul-de-sac on the existing Eaton Road, to the west of the new The Northern Road. The southern section of the cul-de-sac extends into the inn site
- Construction of an intersection off the new The Northern Road onto Eaton Road
- Cut slopes for all of the above
- Construction compound and laydown site.

##### **Impact assessment**

*The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:*

While the project would have a direct impact on archaeological deposits of the inn, the opportunity for undertaking a detailed archaeological investigation of the site prior to its destruction may enhance its significance through the realisation of its research potential. Undertaking archaeological investigation of the site under a well-structured research design by an appropriately qualified historical archaeologist would reveal information and answer questions particularly in relation to the early settlement of Luddenham, and the hotel and inn industry related to use of early roads in NSW.

*The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:*

The construction of The Northern Road upgrade would directly impact part of the curtilage of the site, including the potential archaeological deposits. To minimise impacts and maximise the opportunity for realising research potential at the site the following actions would be undertaken:

- Archaeological investigation in the form of salvage excavation to be undertaken in accordance with the Heritage Division of OEH guidelines including an appropriate research design and methodology in order to best realise the research potential of this area of the site
- Archaeological investigation in the form of salvage excavation would be undertaken under the supervision of an appropriately qualified and experienced historical archaeologist in accordance with the Heritage Division of OEH criteria.

Construction impacts to Item 10 would be physical damage to part of the site.

There would be no operational impacts to Item 10.

##### **Mitigation measures**

A summary of the mitigation measures discussed above in the Impact Assessment are provided in **Table 3**.

Table 3 : Mitigation measures for heritage items.

Heritage item name	Number (if applicable)	Potential impacts	Mitigation measures
Orchard Hills Cumberland Plain Woodland	CHL 105317 RNE 102211	<p>Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values and impacts to the historic heritage values of the site as summarised below:</p> <p>Natural heritage impacts would be related to:</p> <ul style="list-style-type: none"> <li>Clearing of around 9.68 ha of moderate to low significance native vegetation within the western periphery of the CHP including two relic trees located within the north-western portion of the CHP</li> <li>The regrowth natural vegetation communities impacted have been identified as having a reasonable tolerance for change, while the relic trees have a low tolerance for change</li> <li>Additional potential impacts to natural heritage values may include degradation of ecological condition by proliferation of weed species at the CHP, Introduction / disturbance of pathogen and/or disease vectors and indirect impacts to fauna from light pollution (construction and operation).</li> </ul> <p>Historic heritage impacts would be related to:</p> <ul style="list-style-type: none"> <li>Impacts to historic heritage as a result of physical damage to northern section of canal adjacent to The Northern Road, located within the south-western portion of the CHP.</li> </ul>	<ul style="list-style-type: none"> <li>Relevant mitigation measures as per the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS) would be implemented to appropriately manage potential impacts to the natural heritage values of the site</li> <li>Archival photographic recording would be undertaken of the canal.</li> </ul>
Warragamba Dam to Prospect Reservoir pipeline	-	No impact expected	None required

Heritage item name	Number (if applicable)	Potential impacts	Mitigation measures
Miss Lawson's Guesthouse site	-	Physical damage to entire site	Detailed salvage archaeological investigation of the site
Lawson's Inn Site	LLEP 53	Physical damage to part of the site	Detailed salvage archaeological investigation of the site

## **Important note about your report**

The sole purpose of this report and the associated services performed by Jacobs is to prepare a non-Aboriginal heritage assessment in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

The register searches undertaken for this report are current only at the date that a particular register was searched, as noted in the report. Heritage sites may be added to or removed from heritage registers at any time and users of this report should check that sites have not been added or removed from a particular register since the date the register was searched.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.



# 1. Introduction

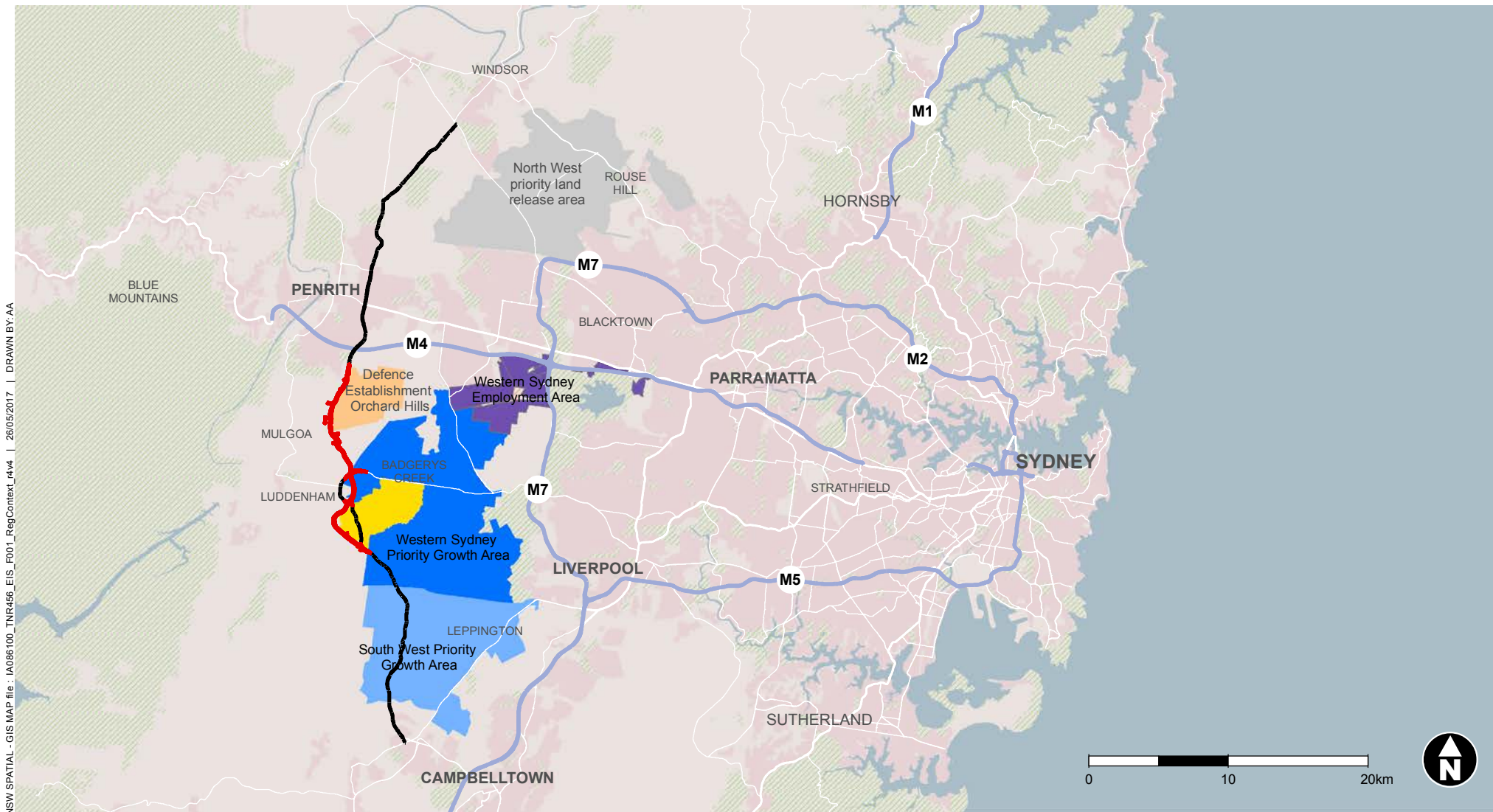
## 1.1 Project background

Roads and Maritime Services (Roads and Maritime) is seeking approval to upgrade about 16 km of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park (the project). The location and regional context of the project is provided in **Figure 1-1**. An overview of the project is shown on **Figure 1-2**.

The project generally comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction). The wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and about 100 m south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham, to realign the section of The Northern Road that currently bisects the Western Sydney Airport site and to bypasses Luddenham
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and about 100 m south of Glenmore Parkway, Glenmore Park
- Closure of the existing The Northern Road through the Western Sydney Airport site
- Tie-in works with the following projects:
  - The Northern Road Upgrade, between Peter Brock Drive, Oran Park and Mersey Road, Bringelly (to the south)
  - The Northern Road Upgrade, between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith (to the north)
- New intersections including:
  - A traffic light intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport, incorporating a dedicated u-turn facility on the western side
  - A traffic light intersection for service vehicles accessing the Western Sydney Airport, incorporating 160 m of new road connecting to the planned airport boundary
  - A traffic light intersection connecting the realigned The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham
  - A 'give way' controlled intersection (that is, no traffic lights) connecting the realigned The Northern Road with Eaton Road (east of the new alignment, left in, left out only)
  - A four-way traffic light intersection formed from the realigned Elizabeth Drive, the realigned The Northern Road and the existing The Northern Road, north of Luddenham
  - A traffic light intersection at the Defence Establishment Orchard Hills entrance, incorporating a u-turn facility
- New traffic lights at four existing intersections:
  - Littlefields Road, Luddenham
  - Kings Hill Road, Mulgoa
  - Chain-O-Ponds Road, Mulgoa
  - Bradley Street, Glenmore Park incorporating a u-turn facility
- Modified intersection arrangements at:
  - Dwyer Road, Bringelly (left in, left out only)

- Existing Elizabeth Drive, Luddenham (left out only)
- Gates Road, Luddenham (left in only)
- Longview Road, Luddenham (left in, left out only)
- Grover Crescent south, Mulgoa (left in only)
- Grover Crescent north, Mulgoa (left out only)
- Dedicated u-turn facilities at:
  - The existing The Northern Road at Luddenham, south-west of Elizabeth Drive
  - The existing Elizabeth Drive, Luddenham around 800 m east of The Northern Road
  - Chain-O-Ponds Road, Mulgoa
- Twin bridges over Adams Road, Luddenham
- Local road changes and upgrades, including:
  - Closure of Vicar Park Lane, east of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, west of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, east of the realigned The Northern Road, Luddenham
  - Elizabeth Drive cul-de-sac, about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive, Luddenham
  - Extension of Littlefields Road, east of The Northern Road, Mulgoa
  - A new roundabout on the Littlefields Road extension, Mulgoa
  - A new service road between the Littlefields Road roundabout and Gates Road, including a 'give way' controlled intersection (that is, no traffic lights) at Gates Road, Luddenham
  - Extension of Vineyard Road, Mulgoa between Longview Road and Kings Hill Road
  - A new roundabout on the Vineyard Road extension at Kings Hill Road, Mulgoa
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required
- The upgrading of drainage infrastructure
- Operational ancillary facilities including:
  - Heavy vehicle inspection bays for both northbound and southbound traffic, adjacent to Grover Crescent, Mulgoa and Longview Road, Mulgoa respectively
  - An incident response facility on the south-western corner of the proposed four-way traffic light intersection at Elizabeth Drive, Luddenham
- New traffic management facilities including variable message signs (VMS)
- Roadside furniture and street lighting
- The relocation of utilities and services
- Changes to property access along The Northern Road (generally left in, left out only)
- Establishment and use of temporary ancillary facilities and access tracks during construction
- Property adjustments as required
- Clearance of undetonated explosive ordinance (UXO) within the Defence Establishment Orchard Hills as required.



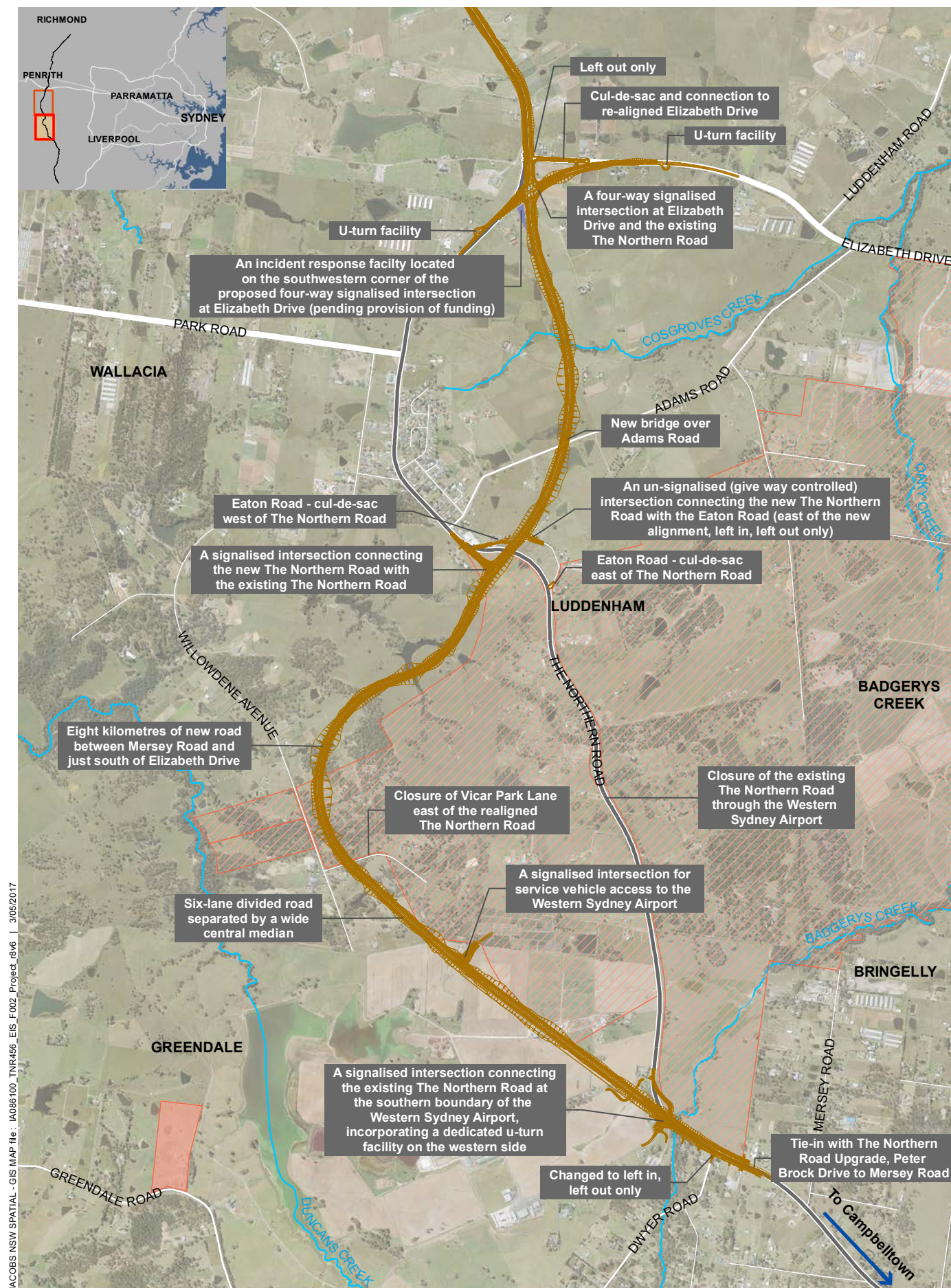
### Legend

- |  |  |   |   |
|--|--|---|---|
| <span style="color: red;">—</span> The Northern Road upgrade - Mersey Road to Glenmore Parkway | <span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> Western Sydney Airport site (Commonwealth Land) | <span style="background-color: darkblue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> Western Sydney Employment Area   | <span style="background: repeating-linear-gradient(45deg, transparent, transparent 2px, green 2px, green 4px); border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> Reserves and parklands |
| <span style="color: black;">—</span> The Northern Road   | <span style="background-color: orange; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> Defence Establishment Orchard Hills             | <span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> South West Priority Growth Area | <span style="background-color: grey; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> Growth centres   |
|  |  | <span style="background-color: blue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> Western Sydney Priority Growth Area  | <span style="background-color: pink; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> Built areas  |

**Figure 1-1** | Location of the project

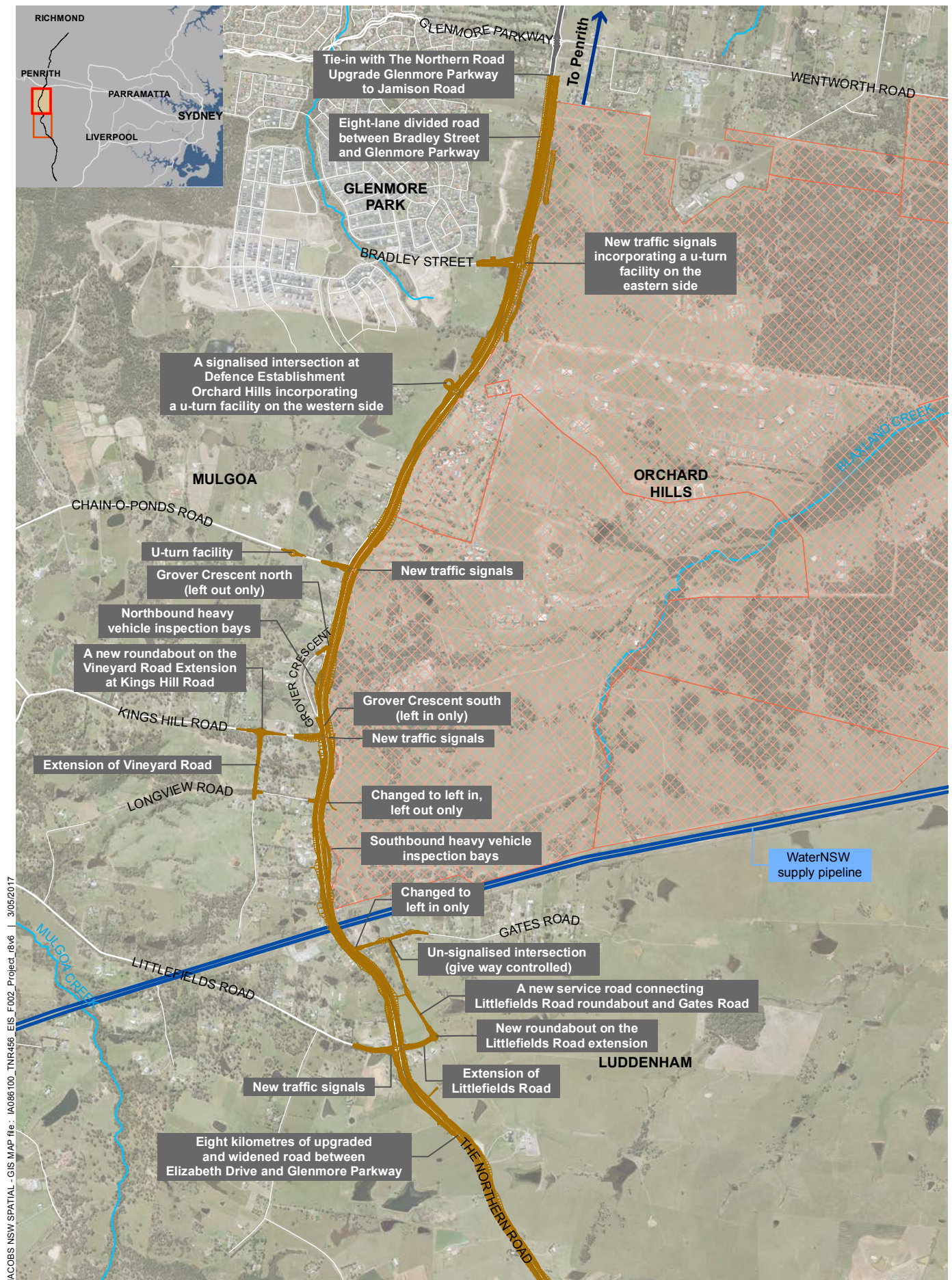
**The Northern Road upgrade - Mersey Road to Glenmore Parkway**





**Figure 1-2** | Overview of the project





JACOBS NSW SPATIAL - GIS MAP file: IA086 100\_TNR456 EIS\_F002 Project\_r8v6 | 3/05/2017

**Figure 1-2** | Overview of the project

The project assessed in this EIS does not include surveys, test drilling, test excavations, geotechnical investigations or other tests, surveys, sampling or investigation for the purposes of the design or assessment of the project.

The upgrade of The Northern Road is part of the Western Sydney Infrastructure Plan (WSIP). The WSIP involves major road and transport linkages that would capitalise on the economic gains from developing the Western Sydney Airport whilst boosting the local economy and liveability of western Sydney. This EIS provides an assessment of the impact of The Northern Road Upgrade between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park.

Jacobs Group (Australia) Pty Ltd (Jacobs) was commissioned by Roads and Maritime Services (Roads and Maritime) to undertake an assessment of the potential environmental impacts of the project, and prepare an Environmental Impact Statement (EIS) in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) that adequately addresses the requirements of those Acts.

## 1.2 Location of the project and study area

The Northern Road is about 45 km west of the Sydney central business district and traverses the local government areas of Penrith in the north and Liverpool in the south.

The Northern Road is a key north–south road between Narellan and Richmond, connecting the North West and South West Priority Growth Areas (see **Figure 1-1**). The corridor intersects with a number of regional motorway, arterial and collector roads such as (north to south) Richmond Road, Great Western Highway, M4 Motorway, Elizabeth Drive, Bringelly Road, and Camden Valley Way.

South of Glenmore Parkway, the project is surrounded by rural residential zoned land as well as pastures and grasslands. Land to the east of The Northern Road in this section is occupied by the Commonwealth Defence Establishment, Orchard Hills. Further south, The Northern Road passes through the village of Luddenham (including a small number of residential and commercial properties), before continuing through agricultural grasslands to its junction with Mersey Road (the northern extent of The Northern Road Upgrade, between Peter Brock Drive, Oran Park and Mersey Road, Bringelly).

A three and half kilometre section of the existing The Northern Road alignment bisects the Western Sydney Airport site south-east of the Luddenham town centre.

The regional context and location of The Northern Road Upgrade is provided on **Figure 1-1**.

The study area for the purpose of this assessment is defined at different stages in the assessment process. In summary, the study area for the desktop assessment was based on previous studies undertaken in the area as well as a search radius of 500 m for all online database searches of heritage registers. This and a review of aerial imagery informed the identification of locations for the field survey (**Figure 4-22**). The assessment of impacts was based on areas where the construction footprint overlaps with the curtilage of identified heritage items (**Section 7**).



### 1.3 Aim and scope of assessment

As part of preparing the EIS, this non-Aboriginal heritage impact assessment identifies the non-Aboriginal heritage items within and immediately adjacent to the project (ie the study area), assesses the potential impacts on the heritage items from the proposed project activities, and develops measures to address impacts. The non-Aboriginal heritage impact assessment addresses archaeology, heritage items and conservation areas, in accordance with NSW Heritage Branch guidelines, and the Australia ICOMOS Charter for Places of Cultural Significance (Burra Charter).

**Table 1-1** lists the Secretary's Environmental Assessment Requirements (SEARs) and Commonwealth EIS Guidelines of relevance to this report and where in the report they are addressed.

Table 1-1: NSW and Commonwealth Environmental Assessment Requirements

Secretary's Environmental Assessment requirement	Where addressed in this report
Impacts to State and local historic heritage (including conservation areas, built heritage, landscapes and archaeology) should be assessed. Where impacts to State or locally significant historic heritage are identified, the assessment shall: <ul style="list-style-type: none"> <li>be undertaken by a suitably qualified heritage consultant(s) with relevant heritage expertise (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria),</li> </ul>	The methodology outlined for the assessment is provided in <b>Sections 3.2.2, 4.1, and 5.1</b> . Details of the qualifications of the heritage consultants undertaking this assessment are provided in <b>Table 1-2</b> .
<ul style="list-style-type: none"> <li>Include a statement of heritage impact for all heritage items/conservation areas to be impacted (including significance assessment). This should include detailed mapping of all heritage items and how they are affected by the proposal,</li> </ul>	Statements of heritage impact are provided in <b>Section 0</b> and significance assessments are provided in <b>Section 5</b> . Heritage items located within the study area are shown on <b>Figure 5-1</b> .
<ul style="list-style-type: none"> <li>Include details of any proposed mitigation measures (architectural and landscape),</li> </ul>	Proposed mitigation measures are outlined throughout <b>Section 0</b> and summarised in <b>Section 8.1</b> .
<ul style="list-style-type: none"> <li>Consider impacts from, including but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant),</li> </ul>	Statements of heritage impact which consider direct and indirect impacts are provided in <b>Section 0</b> .
<ul style="list-style-type: none"> <li>Detail proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures), which are developed consistent with the guidelines in the NSW Heritage Manual (Heritage Office and DUAP 1996),</li> </ul>	Proposed mitigation measures are outlined throughout <b>Section 0</b> and summarised in <b>Section 8.1</b> .
<ul style="list-style-type: none"> <li>Include provision of future mitigation strategies for all identified archaeological impacts that would arise from the proposal, and</li> </ul>	Proposed mitigation measures are outlined throughout <b>Section 0</b> and summarised in <b>Section 8.1</b> .
<ul style="list-style-type: none"> <li>Where physical archaeological test excavations are proposed, develop an appropriate archaeological assessment methodology, including research design, in consultation with the Heritage Council of New South</li> </ul>	Mitigation measure, including the requirement for salvage excavation to be undertaken in accordance with the Heritage Division of OEH guidelines

Secretary's Environmental Assessment requirement	Where addressed in this report
Wales (for items of State significance) and the Department, to guide the test excavations, and include the results of these excavations.	including an appropriate research design and methodology, is outlined in <b>Section 7</b> .
Commonwealth EIS Guidelines	Where addressed in EIS
A description of the environment in all areas of potential impact, including all components of the environment as defined in Section 528 of the EPBC Act: <ul style="list-style-type: none"> <li>heritage values of places</li> </ul>	The historical and heritage context of the project area is provided in <b>Section 3</b> . Statements of heritage impact are provided in <b>Section 0</b> and significance assessments are provided in <b>Section 5</b> .
To support the assessment of local historic and indigenous heritage values, the EIS must include a full heritage impact assessment	Statements of heritage impact are provided in <b>Section 0</b> and significance assessments are provided in <b>Section 5</b> . Heritage items located within the study area are shown on <b>Figure 5-1</b> .
Impacts to the environment (as defined in section 528) should include but not be limited to the following: <ul style="list-style-type: none"> <li>Removal and degradation of heritage items/places (historic, natural and indigenous)</li> </ul>	Statements of heritage impact are provided in <b>Section 0</b> and significance assessments are provided in <b>Section 5</b> . Heritage items located within the study area are shown on <b>Figure 5-1</b> .  Indigenous heritage impact assessment is provided in The Cultural Heritage Assessment Report (CHAR) prepared for the project

## 1.4 Authorship of assessment

This report has been prepared by Jennifer Chandler (Project Archaeologist, Jacobs) and Sally Waller (Senior Ecologist and Spatial Consultant, Jacobs). The field survey was undertaken by Jennifer Chandler, and Amanda Goldfarb (Project Archaeologist, Jacobs). Overview of the assessment including a technical review of the report was undertaken by Dr Karen Murphy (Technical Leader (Historical Heritage), Jacobs). Additional historical research was undertaken by Robert Williamson (Legal Searcher). Mapping was prepared by Ajay Arcot (Senior Spatial Consultant, Jacobs).

Jennifer has over ten years' experience in the cultural heritage industry, and has worked in Victoria, New South Wales, Western Australia and Thailand. She has conducted numerous cultural heritage assessments for state government departments, utilities companies and private developers. Jennifer has recorded Aboriginal and non-Aboriginal heritage places, completed and organised environmental pedestrian field surveys, undertaken manual sub-surface testing and salvage excavation, and has experience in artefact analysis. She is also skilled in liaising with stakeholders from all aspects of the community.

Sally has over 13 years' professional experience in ecology and spatial science and has over ten years' experience working on a variety of Commonwealth projects across Australia. Sally's strengths include plant and landscape ecology, GIS and mobile mapping. She is experienced with the terrestrial ecology of inland, montane and coastal Australia (Qld, NSW, ACT, Vic, Tas, WA) and Papua New Guinea. Sally is also familiar with wetland and marine ecology. Sally is proficient in the application of Commonwealth and interstate legislation as relevant to Commonwealth land. Sally has contributed her project management and technical skills to a variety of single and multidisciplinary projects (e.g. ecological, heritage, noise, planning, spatial, infrastructure upgrade

and land contamination disciplines). Sally's technical experience includes flora and fauna (including threatened species) surveys, assessments, management, monitoring and related GIS (mapping), remote sensing and spatial data analyses. Sally has also produced various natural heritage assessments for activities on Commonwealth land.

Amanda has authored, co-authored and contributed to a variety of reports, including Environmental Impact Assessments, Environmental Effects Statements, Heritage Impact Assessments, Cultural Heritage Management Plans (CHMPs), Due Diligence Reports, and Archaeological Assessment Reports. She has recorded Aboriginal and historical sites, completed environmental field surveys, performed and supervised salvage and sub-surface excavations, and has experience in artefact analysis, liaising with stakeholders, archaeological photography and stratigraphic illustration.

Karen has 15 years' experience in historical heritage management in government, academic and consultancy roles. She has comprehensive knowledge of Australian heritage legislative and policy frameworks, and experience in the development of heritage policy and legislative guidelines for the Queensland government. Karen has undertaken heritage projects in all states in Australia for local, state and federal government, and infrastructure development groups. Karen has skills and experience in historical heritage assessment, conservation management plans, impact assessment, historical research and the supervision and management of survey, excavation and artefact analysis. She has recently been appointed as the alternate archaeology member on the Heritage Council of Victoria.

The qualifications of each heritage consultant are provided in **Table 1-2**.

Table 1-2: Heritage consultants undertaking this assessment

Name	Qualifications	Role
Dr Karen Murphy	PhD (Historical Archaeology) Bachelor of Arts (Honours) (Archaeology)	Management and direction of overall assessment Technical review of report
Jennifer Chandler	Master of Cultural Heritage Bachelor of Archaeology (Honours) Honours thesis: Historical heritage	Field survey Writing and preparation of report
Sally Waller	Masters GIS and Remote Sensing Bachelor of Science (Environmental and Analytical)	Writing of natural heritage sections of report
Amanda Goldfarb	Bachelor of Arts/Bachelor of Science (Archaeology, English, Physics) Bachelor of Arts (Honours – Archaeology) Masters of Arts (Archaeology)	Field survey

## 2. Legislative framework

### 2.1 State legislation

#### 2.1.1 *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) requires that environmental impacts are considered in land-use planning, including impacts on Aboriginal and non-Aboriginal heritage. Various planning instruments including Local Environmental Plans (LEP) prepared under the EP&A Act identify permissible land use and development constraints. The development of LEPs is governed under the provisions of Part 3, Division 4 of the EP&A Act. The Secretary of the NSW Department of Planning and Environment is required to issue SEARs upon receiving an application for approval of State Significant Infrastructure. The EIS prepared as part of this process must address impacts to heritage as required by the SEARs under Part 5.1 of the EP&A Act.

#### 2.1.2 *Heritage Act (NSW) 1977*

The *Heritage Act 1977* (the Heritage Act) provides a number of mechanisms by which items and places of heritage significance may be protected. The Heritage Act is designed to protect both listed heritage items, such as standing structures and potential archaeological remains or relics. Different parts of the Heritage Act deal with these different situations.

Approvals under Part 4 or an excavation permit under s139 of the Heritage Act are not required for an approved project under Part 5.1 of the EP&A Act, however, this assessment follows the intent of the Heritage Act and the conditions of the approval which are based upon the Heritage Act requirements.

##### 2.1.2.1 State Heritage Register

The Heritage Council of NSW maintains the State Heritage Register (SHR). Only those items which are of state-level heritage significance in NSW are listed on the SHR. Listing on the SHR controls activities such as alteration, damage, demolition and development.

Approved projects to which Part 5.1 of the EP&A Act applies do not require approval under Part 4 of the Heritage Act (e.g. a Section 60 approval) for items on the SHR. However, Part 5.1 projects must assess impacts and outline proposed heritage management and mitigation measures.

##### 2.1.2.2 Archaeological relics

Part 6 Division 9 of the Heritage Act protects archaeological 'relics' from being 'exposed, moved, damaged or destroyed' by the disturbance or excavation of land. This protection extends to the situation where a person has 'reasonable cause to suspect' that archaeological remains may be affected by the disturbance or excavation of the land. It applies to all land in NSW that is not included in the SHR. A 'relic' is defined by the Heritage Act as:

Any deposit, object of material evidence which relates to the settlement of the area that comprises NSW, not being Aboriginal settlement, and has local or state significance.

Section 139 of the Heritage Act requires any person who knows or has reasonable cause to suspect that their proposed works would expose or disturb a 'relic' to first obtain an Excavation Permit from the Heritage Council of NSW (pursuant to section 140), unless there is an applicable exception (pursuant to section 139(4)). In cases where a Section 139 permit is not required for projects assessed under Part 5.1 of the EP&A Act, works would need to be conducted in accordance with the intent of the Heritage Act.

Section 146 of the Heritage Act requires any person who is aware or believes that they have discovered or located a relic must notify the Heritage Council of NSW providing details of the location and other information required.

## 2.2 Commonwealth heritage legislation

### 2.2.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act includes 'national heritage' as a matter of National Environmental Significance and protects listed places to the fullest extent under the Constitution. It also establishes the National Heritage List (NHL) and the Commonwealth Heritage List (CHL).

For proposed actions situated on Commonwealth land or which may impact on Commonwealth land, the guidelines *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies (Significant Impact Guidelines 1.2)* apply. The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on the environment, including the heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the the Australian Government Minister for the Environment and Energy (the Minister) for approval.

The following is a description of each of the heritage lists and the protection afforded places listed on them.

#### 2.2.1.1 Commonwealth Heritage List

The CHL is established under the EPBC Act. The CHL is a list of properties owned by the Commonwealth that have been assessed as having significant heritage value. Any proposed actions on CHL places must be assessed for their impact on the heritage values of the place in accordance with *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies (Significant Impact Guidelines 1.2)*. The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on the environment, including the heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the Minister for approval.

Additionally, the EPBC Act (s341Y) requires CHL places to be managed in accordance with the Commonwealth Heritage management principles, which encourages identification, conservation and presentation of a place's heritage values through applying best available skills and knowledge, community (including indigenous) involvement and co-operation between various levels of government. The principles are set out in Schedule 7B of the EPBC Regulations.

#### 2.2.1.2 National Heritage List

The NHL is a list of places with outstanding heritage value to Australia, including places overseas. This means that a person cannot take an action that has, will have, or is likely to have, a significant impact on the national heritage values of a national heritage place without the approval of the Minister. Any proposed actions on NHL places must be assessed for their impact on the heritage values of the place in accordance with *Management of National Environmental Significance (Significant Impact Guidelines 1.1)*. The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on a matter of National Environmental Significance, including the national heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the Minister for approval.

#### 2.2.1.3 Register of the National Estate

The Register of the National Estate (RNE) was formerly compiled as a record of Australia's natural, cultural and Aboriginal heritage places worth keeping for the future. Places on the RNE that are in Commonwealth areas, or subject to actions by the Australian Government, are protected under the EPBC Act by the same provisions that protect Commonwealth Heritage places. The RNE was frozen on 19 February 2007, which means that no new places have been added or removed since that time. From February 2012 all references to the RNE were removed from the EPBC Act. The RNE is maintained on a non-statutory basis as a publicly available archive.

### 3. Background

#### 3.1 Historical context

There are several towns and areas associated with the study area: Orchard Hills and Glenmore Park in the north of the study area, Mulgoa in the centre and Luddenham in the south.

Europeans first arrived in the Orchard Hills area around 1804 when large land grants were made available. The area was considered suitable for grazing but smaller agricultural grants in areas of alluvial soil near creeks were also available. The Reverend Samuel Marsden had acquired land in the area in 1794, and in 1804 he received a grant of 1,030 acres for the development of a wool industry in the colony. His estate was named Mamre and crops of hemp and flax were also grown here. The homestead had a fruit orchard that was 20 acres in size. Large and small land grants were also made available in 1809, the largest being 2,000 acres, which went to Gregory Blaxland. Blaxland had arrived in the colony in 1805 and later became known for his exploration of the Blue Mountains with William Lawson and William Charles Wentworth. These grants were made to free settlers, public servants and emancipists. The land in the northern half of Orchard Hills, except for Marsden and Blaxland's land became part of the Regentville estate (Paul Davies Pty Ltd 2007:196-198). In 1904 a Methodist Church was built in Orchard Hills and in 1910 a public school was opened to service the community that had grown through subdivisions in the area in 1888-1889. Residents comprised of farmers, railway employees, a dairyman and an orchardist. Today this rural area is utilised for market gardening and orchards (Paul Davies Pty Ltd 2007:199).

In the southern part of Orchard Hills, and part of the study area, a large allotment of Commonwealth government acquired land was first used by the Royal Australian Air Force (RAAF) and Royal Australian Navy (RAN) in the mid-1940s in a limited capacity. In the 1950s the RAAF established the No. 1 Central Ammunition Depot. The depot, which is now called Defence Establishment Orchard Hills, currently stores munitions, contains development facilities and is a training centre (Paul Davies Pty Ltd 2007:199).

The Mulgoa Valley, to the west of the study area, was first explored by Europeans when Captain Tench led an expedition along the Nepean River in 1789. There were further expeditions into the region over the next few decades with the surveying of Mulgoa Valley occurring in 1809. Land grants were made in Mulgoa, to the west of the study area, from 1810 until 1816. These grants were large blocks of land given to men with financial or official status. A large estate called Regentville was established by Sir John Jamison and had reached a size of 3,890 ha by 1834 (Paul Davies Pty Ltd 2007:169). The carriage drive approach to the house from Penrith overlaps with present day Glenmore Park. The estate was sold in 1847, and in the early 1860s the central section of the estate was subdivided into farms ranging from 23 to 51 acres in size (Paul Davies Pty Ltd 2007:103). The more recent suburban development of Glenmore Park occurred in the late 1980s when the area was developed by Penrith City Council (Paul Davies Pty Ltd 2007:104).

In the Luddenham region, early settler John Blaxland (brother of Gregory Blaxland) was granted 6,710 acres in 1813. The land, which overlapped with the study area, was called 'Luddenham' and was used primarily for cattle and sheep grazing. The western portion of Blaxland's property, near the Nepean River, was developed with buildings, water and grain storage structures and a brewery. However, the eastern portion, located near the current Luddenham township remained undeveloped. Another early settler, D'Arcy Wentworth (father of William Charles Wentworth), was granted 1,200 acres of land located between The Northern Road and the Nepean River. The property was called 'Greendale' and overlapped with part of the study area (Australian Museum Consulting 2014:21-23).

Initially, travel into the region would have been difficult, but became easier in 1815 when the Western Road began to be constructed (Thorp 1986:12). The Northern Road, also known as Bringelly Road, was important as it connected the town settlement at Richmond with rural estates at Cowpastures (Camden). Elizabeth Drive, originally called Orphan Creek Road, connected the town settlement of Liverpool with the Mulgoa Valley (Paul Davies Pty Ltd 2007:41).

By 1859 the land around Luddenham had been subdivided and was for sale. An area called 'Luddenham Village' was subdivided into one acre and half acre blocks and was located on the eastern side of The Northern



Road. The village was located close to the Thistle Inn which was run by John Lawson. There was also provision made at this time for a school and a church. As a result of the subdivision, the township of Luddenham developed. Between 1857 and the 1880s two churches, a post office and a hall were built (Australian Museum Consulting 2014:24-25). Today Luddenham is a semi-rural township surrounded by agricultural rural land.

## 3.2 Heritage context

### 3.2.1 Previous heritage assessments

#### ***Western Sydney Airport EIS (RPS Manidis Roberts 2015)***

An EIS was undertaken for the Western Sydney Airport project (RPS Manidis Roberts 2015). The north-west section of the study area overlaps with the current study area. The study included background research, field survey and test excavation. A total of 41 non-Aboriginal heritage items were identified and assessed within the study area. No previously unregistered heritage items were located within the current study area. One registered heritage item is located within the current study area:

- Lawson's Inn – Lot 2 DP623457 - Liverpool Local Environmental Plan 2008 (LLEP). This heritage item was not considered further in the report as it was located outside the airport site area.

One previously unregistered heritage item is located adjacent to the current study area:

- The Northern Road alignment within the airport site – 'The Northern Road alignment is considered to be historically significant as one of the earliest roads in the area, predating the subdivision of early land grants in the area' (RPS Manidis Roberts 2015:63). This heritage item boundary is located adjacent to the project current area; however, The Northern Road extends into the current study area.

The report assessed The Northern Road alignment within the airport site as meeting the following Commonwealth heritage significance criterion:

- Events and processes – 'The Northern Road has been an important historic thoroughfare linking the nascent communities of Camden and Windsor. Although it has been upgraded and alignments in some sections have changed, it has followed the same basic route since the early nineteenth century'
- Research – 'The alignment of the road has been well mapped since its construction. However there may be areas of original alignment that demonstrate early road building techniques and materials (RPS Manidis Roberts 2015:143).

The report recommended that archaeological investigations be undertaken for 'former parts of The Northern Road alignment, particularly in the vicinity of St Francis Xavier Church, should be undertaken to identify whether early road construction technologies such as corduroy were used in the alignment' (RPS Manidis Roberts 2015:77). The St Francis Xavier Church section of The Northern Road is located around 900 m south of the current study area.

#### ***The Northern Road Stage 4, Route Options Assessment (Artefact Heritage 2015)***

A route options assessment was undertaken for Stage 4 of the study area (Artefact Heritage 2015). The report assessed the non-Aboriginal heritage constraints for 12 route options within a large study area which encompassed the Luddenham and Western Sydney Airport bypass area (north of the Warragamba Dam to Prospect Reservoir pipeline near Gates Road is not included). A total of 13 registered historical heritage items were identified within their study area. The following is located within the current study area:

- Lawson's Inn Site (listed on the Liverpool LEP (LLEP))

The report identified five additional potential historical heritage items:

- Lawson's Inn site – the consultants concluded from preliminary research that the LEP-listed site of Lawson's Inn has been incorrectly located on the western side of The Northern Road. Eaton Road is therefore the original road alignment of the Northern Road, and the Lawson's Inn site is actually located between Eaton Road and The Northern Road (i.e. to the east of The Northern Road). The consultants undertook a site inspection in 2015 and identified potential archaeological features including two in-filled

stone lined wells or reservoirs, European trees, worked sandstone blocks a potential former road cutting and possible sandstone gatepost base on a property to the north of Eaton Road (Artefact Heritage 2015: Figure 27). They also noted that the property owner had identified this site as the location of Lawson's Inn, which was demolished in the 1940s (Artefact Heritage 2015:24-25). The report also mapped the potential site of the former Lawson's Inn (Artefact Heritage 2015: Figure 27) but no survey results were provided for this particular location. Both the area north of Eaton Road and the area between Eaton Road and The Northern Road are located within the current study area

- Chapel and School site – the consultants concluded from preliminary research that a small chapel and school marked on a 1859 plan as being located near Lawson's Inn is likely to be situated on the northern side of Eaton Road. This area overlaps with a number of current residences (Artefact Heritage 2015:28). Part of this area is located within the current study area with the remainder located immediately adjacent to the current study area
- Harris's cottage – a subdivision plan from 1864 indicated that there was a single building located in the fork of a watercourse between two dams. After examining modern aerial photography the consultants concluded that there was potential for archaeological remains associated with the original homestead (Artefact Heritage 2015:29). This site area is located about 200 m west of the current study area
- Earlier alignments of The Northern Road – as Eaton Road represents an earlier alignment of The Northern Road there is potential for uncovering previous road structures in this location (Artefact Heritage 2015:33). Eaton Road is located within the current study area
- Dairy shed and well/cistern – originally identified in an earlier historical heritage report (Badgerys Creek Initial Environment Survey, Australian Museum Consulting 2014), it was noted that the location of these items were difficult to ascertain. A possible location was identified on the corner of Adams Road and Jamison Road however the consultants suggested that it may be further along Adams Road in a more rural setting (Artefact Heritage 2015:33). The location originally suggested by Australian Museum Consulting (2014) is 150m north of the current study area; however, Adams Road intersects with the current study area further away from Luddenham which corresponds with the location predicted by Artefact Heritage (2015).

#### ***Western Sydney Infrastructure Plan. Northern Road Upgrade Preliminary Environmental Investigation (ngh environmental 2015)***

A Preliminary Environmental Investigation was undertaken for the Northern Road Upgrade as part of the Western Sydney Infrastructure Plan (ngh environmental 2015). The large study encompassed the current study area. Part of the assessment included an overview of the local historic areas, and a search of heritage registers. The register search identified:

- one Commonwealth Heritage item – Orchard Hills Cumberland Plain Woodland
- eight Liverpool LEP heritage items – Lawson's Inn Site, Luddenham Public School, Vicary's Winery Group, Vicary's Winery Horse Shed (Former), Vicary's Winery Main House and Garden, Vicary's Winery Vineyard, Vicary's Winery Woolshed and Vicary's Winery, Wine Tasting and Cellar Door Sales Building
- eight Penrith LEP heritage items – two brick cottages in Luddenham, Luddenham Progress Hall, Luddenham Uniting Church, Luddenham Uniting Church Cemetery, St. James Church of England Cemetery, St. James Church of England, timber cottages in Luddenham.

Two of the listed historical heritage items are located within the current study area: Orchard Hills Cumberland Plain Woodland (CHL listed) and Lawson's Inn site (LLEP listed). The report noted that many roads in the area are from the early settlement of the western Sydney area and there is potential of uncovering previous road structures in the current study area (ngh environmental 2015:53).

#### ***Badgerys Creek Initial Environmental Survey: Historic Heritage (Australian Museum Consulting 2014)***

An Initial Environmental Survey for historical heritage was undertaken for Commonwealth-owned land at Badgerys Creek by Australian Museum Consulting in 2014 on behalf of the Western Sydney Unit of the Commonwealth Department of Infrastructure and Regional Development. Part of the study area overlaps with the current study area, south of Luddenham. The field survey for the assessment identified two potential heritage items, one of which is in the current study area:

- B9 – Former Lawson's Inn Site (The Thistle site), 2155 The Northern Road, Luddenham. The assessment identified that there may be some confusion relating to the location of Lawson's Inn and that the actual location of the inn is within land between The Northern Road and Eaton Road, instead of to the west of The Northern Road (where the LLEP site is mapped). The report noted that the archaeological remains of the inn would likely have some integrity due to lack of substantial development in the area and that the site would be considered to be a state significant archaeological site (Australian Museum Consulting 2014:56).

The following heritage item may also be located within the study area:

- L11 – Dairy Shed, Lot 10 Adams Road, Luddenham. The report noted that the dairy shed was originally identified in a previous report by Godden Mackay in 1997. The address in the report was not able to be re-located (see also Artefact Heritage 2015 discussion above). The report details dairy sheds and a cistern or well which are likely to have some archaeological potential. The authors concluded that the dairy should be located and an assessment undertaken to determine the extent, if any, of impacts arising from any future development in the vicinity (Australian Museum Consulting 2014:66). There is a possibility that the dairy is located within the current study area.

### ***Heritage Management Plan for Defence Establishment Orchard Hills (Godden Mackay Logan 2013)***

The Defence Establishment at Orchard Hills (DEOH) is Commonwealth land and has been identified on the CHL as a place with Commonwealth heritage values (natural, Indigenous and historic values), listed as 'Orchard Hills Cumberland Plain Woodlands'. The western periphery of this Commonwealth Heritage Place (CHP) overlaps with the eastern portion of the project, adjacent to the eastern edge of the existing The Northern Road. The natural and historic values of the site are considered relevant to this assessment and are considered further throughout this report.

A Heritage Management Plan (HMP) (Godden Mackay Logan 2013) was undertaken for the DEOH. Site inspections were undertaken as part of the development of the HMP to verify and update the heritage values of the site and identify heritage features (Godden Mackay Logan 2013). The HMP includes an assessment of the heritage values of the site, including a significance ranking for both the natural and historic heritage values of the site. Further the HMP assigns a tolerance for change ranking to different elements of the natural and historic heritage of the site, including an overall whole of site approach in relation to any new development, demolition and remediation works on the site.

The HMP takes account of the requirements of the EPBC Regulations including Schedule 7B in relation to the Commonwealth Heritage management principles. Heritage management strategies and guidelines are outlined in the plan to address the principles and to ensure the conservation of heritage values across the site. Therefore by reviewing and incorporating relevant aspects of the HMP into this assessment, including the significance and tolerance for change rankings of potentially impacted areas, the Commonwealth Heritage management principles are considered to be complied with through this assessment.

The report outlines three phases of development that occurred on the land:

- Phase 1: Early European Settlement (1804-1880s);
- Phase 2: Orchards, Grazing and Irrigation (1880s-1940s)
- Phase 3: Defence Use (1942-2012).

The DEOH is currently still used as a defence site. Within the HMP, the DEOH is divided into eight sectors each with different functions. The project is located adjacent to and partially within the following three sectors along the western periphery of the site:

- Sector A – Domestic area, contains housing, the working and living accommodation areas
- Sector B – Northern buffer
- Section H - Southern buffer zone.

Sector A is one of the sectors where development is concentrated. This is part of the DEOH site but does not form part of the area covered by the CHL. Sectors B and H are included in the areas where remnant natural landscape is concentrated. A map of the sectors is shown in Figure 3-1 below



Figure 3-1 : Site plan showing sectors within DEOH (source: Godden Mackay Logan 2013)

The natural environment of the Orchard Hills Cumberland Plain Woodlands CHP includes gently undulating topographic relief, dissected by Blaxland Creek and associated tributaries that generally flow towards South Creek. The natural heritage values of the site are mainly focused on its natural vegetation, which includes areas of original native vegetation (including very old relic trees) as well as the natural regrowth of these original plant communities (Godden Mackay Logan (2013)).

The CHP has experienced some historic and on-going disturbance. Native vegetation covers approximately 30% of the site and includes forest, woodland and regrowth thickets of good condition, despite weed incursion from the Defence Estate Orchard Hills, located in the centre of the CHP (Godden Mackay Logan 2013). This includes small remnants and regenerating areas of Cumberland Plain Woodland, Castlereagh Ironbark Forest and Sydney Coastal Riverflat Forest (River Flat Eucalypt Forest) persist, particularly in the eastern portion of the CHP. Cumberland Plain Woodland is listed as a critically endangered ecological community at both state (*Cumberland Plain Woodland in the Sydney Basin Bioregion*) and Commonwealth levels (*Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*). The CHP is considered a core biodiversity area for the conservation of these communities, and the place comprises the least disturbed and largest remaining remnant of Cumberland Plain Woodland (Godden Mackay Logan 2013).

Historic tree clearing and introduction of improved pastures has caused a reduction in deep rooted tree cover and native grass cover across the CHP. The reduction in deep rooted trees and land management practices (e.g. mowing, slashing, overgrazing of opportunistic herbivores, such as stock, macropods and rabbits) has led to reduced surface water infiltration, increased runoff and raised groundwater levels, hence resulting in moderate to high saline soils that are prone to erosion and topsoil loss.

**Figure 3-2** provides a map of the natural heritage significance of the CHP mapped within the DEOH site. The western periphery of the CHP which overlaps with the construction footprint, within Sectors B and H of the DEOH, has been identified to include areas of moderate to low natural heritage value being regenerating patches of vegetation occurring within largely cleared grasslands with a mixture of native and introduced species (Godden Mackay Logan 2013).

The natural heritage significance of aquatic fauna and its habitat has been ranked as moderate to high within areas of the DEOH, including areas within the CHP, as shown in **Figure 3-3** (Godden Mackay Logan 2013).



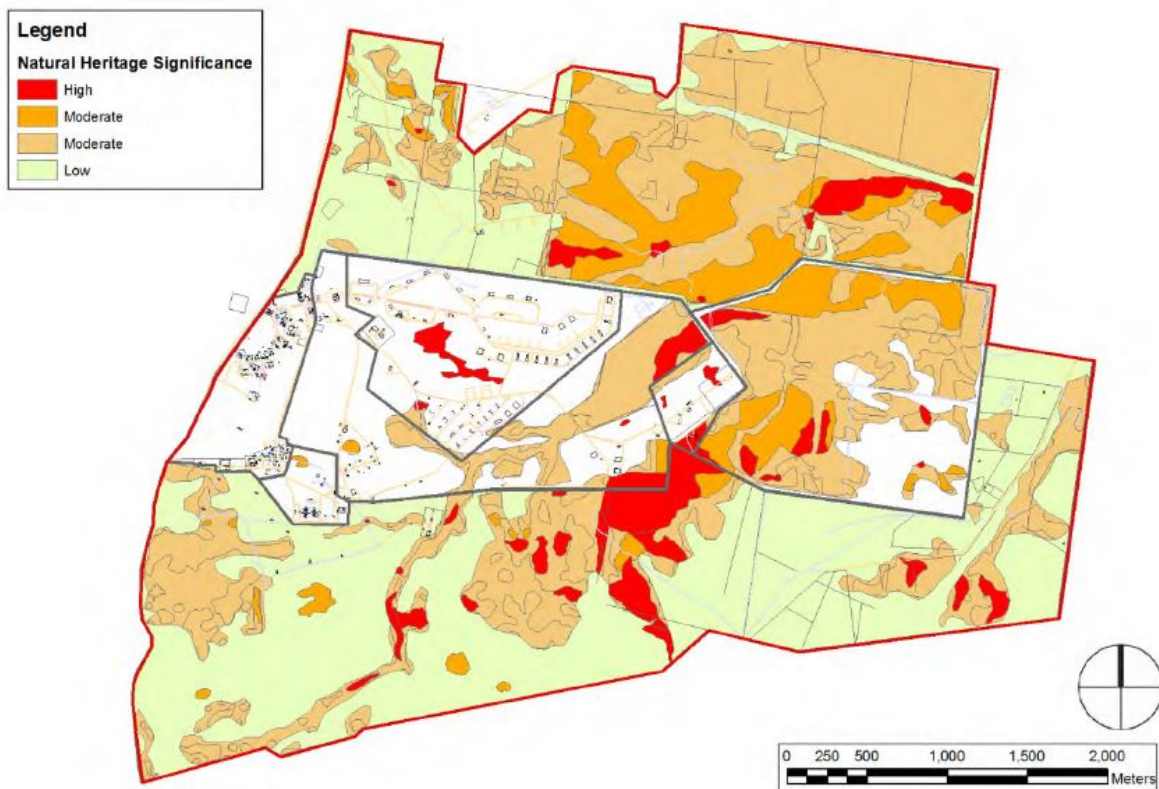


Figure 3-2 : Natural heritage significance of the Orchard Hills Cumberland Plain Woodland CHP (source: Godden Mackay Logan 2013)

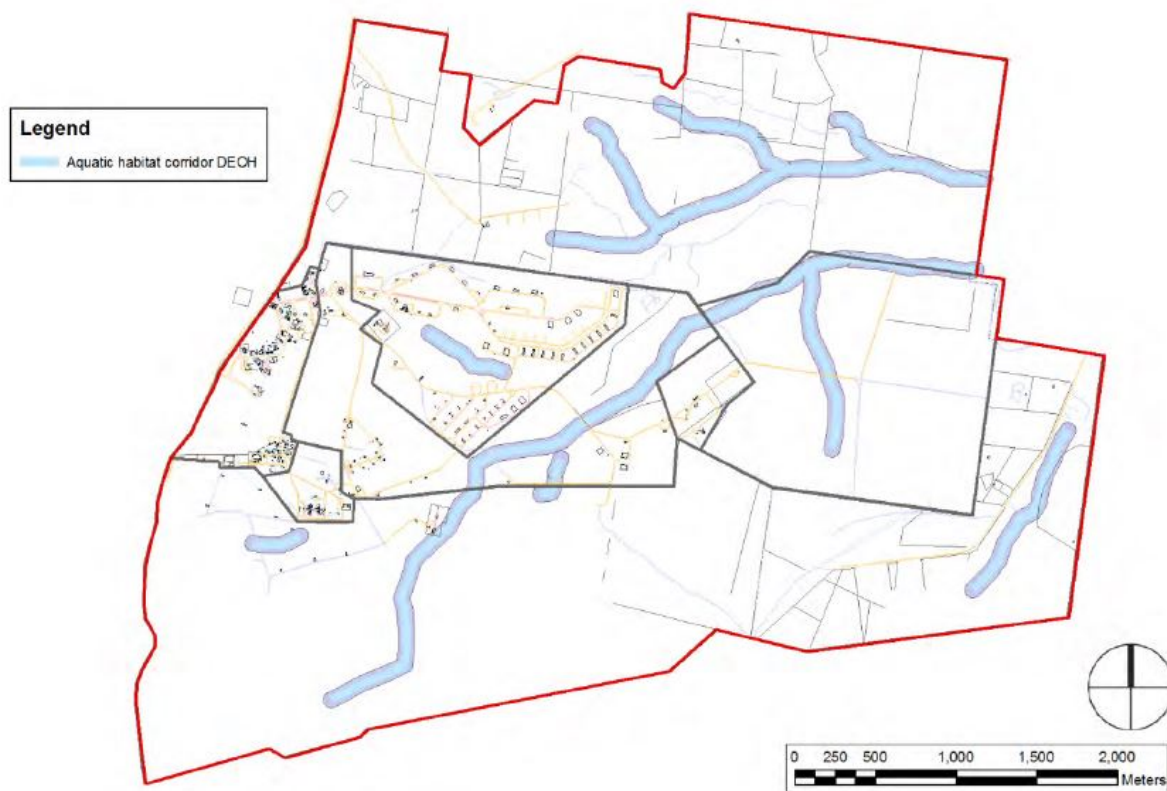


Figure 3-3 : Indicative aquatic habitat corridor on the DEOH site (source: Godden Mackay Logan 2013)

In relation to its historic heritage values, the HMP identifies the DEOH site as containing highly significant remnants of the Mulgoa Irrigation Scheme, located within the south-western section of the CHP. A survey was undertaken for the purpose of the HMP which investigated historical archaeological potential in seven sectors, including sectors H and B, some of which overlaps with the construction footprint along the western periphery of the CHP. During the survey it was noted that 95 % of the irrigation canal still remains in comparison with a 1947 aerial of the canal. The remaining five per cent was impacted by straightening of The Northern Road. The following features were identified during the survey:

- Single and twin water channels, some with deep earth banking,
- Three terracotta culverts (across shallow first order water courses), and
- A bridge crossing a deeper second order water course (Godden Mackay Logan 2013: 70).

### Penrith Heritage Study (Paul Davies Pty Ltd 2007)

A heritage study undertaken for the Penrith City Council in 2007 (Paul Davies Pty Ltd) included the current study area. The study found that despite the early development and history of the area, little physical fabric from this remains due to development (Paul Davies Pty Ltd 2007:24). Within the current study area the following suburbs were subject to the assessment: Glenmore Park, Mulgoa, Orchard Hills and Luddenham. The results for each suburb are summarised below and the heritage items within the current study area presented in **Table 3-1**.

- Glenmore Park - No potential heritage items were identified during fieldwork (Paul Davies Pty Ltd 2007:104).
- Mulgoa - Seven existing LEP heritage items, nine heritage items previously identified (Inventory of the Penrith Heritage Study 1987, and listed in Schedule 3 of the *Sydney Regional Environmental Plan No. 13 – Mulgoa Valley* (gazetted 11 December 1987)) and six existing nominated heritage items were identified. None of these are within the current study area. During fieldwork four additional potential historical items were identified. One of these is located within the current study area.
- Orchard Hills - Six existing heritage items at the time of the fieldwork, and four existing nominated heritage items were identified. Three of these are relevant to the current assessment. During fieldwork seven additional potential historical heritage items were identified, with one being situated within the study area.
- Luddenham - Located in the southern section of the Penrith Heritage Study area, there were seven known heritage items, and one existing nominated heritage item identified. One of these is located within the current study area. During fieldwork an additional three potential heritage items were identified. One of these is located within the current study area.

Table 3-1 : List of heritage items identified in Penrith Heritage Study (Paul Davies Pty Ltd 2007).

Suburb	Heritage item number	Heritage item name	Description
Mulgoa	PC-07	Water Supply Pipelines	<i>The water supply line between Warragamba dam and Prospect reservoir cuts across the southern half of the LGA. The dual pipelines of massive diameter set within a cleared easement are a prominent landmark in the region and demonstrate steel fabricating technology of their day. The pipeline however has no particular significance to the history of Penrith (Paul Davies Pty Ltd 2007:206).</i>
Orchard Hills	PC-03	The Northern Road	<i>The Northern Road was nominated for its historic interest as an early colonial road. While alignment of the road in following a narrow ridgeline continues to be of historic interest the road has been upgraded and roadside margin cleared of trees. The elevation of the road provides impressive views of the Blue</i>



Suburb	Heritage item number	Heritage item name	Description
			<i>Mountains to the west. It is not recommended for listing (Paul Davies Pty Ltd 2007:205).</i>
Orchard Hills	OH-01	Rural landscape (area)	<i>A rural landscape of undulating hills with planted-out orchards and vineyards, farmhouses set on steep knolls, and gridded network of narrow roads. The majority of the extant houses post date 1950 (Paul Davies Pty Ltd 2007:204).</i>
Orchard Hills	OH-04	Rural landscape (roadside), Northern Road	<i>Remnant trees and pastures of early forests and agricultural lands to western side of Orchard Hills locality (Paul Davies Pty Ltd 2007:205).</i>
Orchard Hills	PC-07	Water Supply Pipelines	<i>Description as listed above</i>
Luddenham	PC-03	The Northern Road	<i>Description as listed above</i>
Luddenham	PC-07	Water Supply Pipelines	<i>Description as listed above</i>

***Colonial Landscapes of the Cumberland Plain and Camden, NSW. A Survey of Selected Pre-1860 Cultural Landscapes from Wollondilly to Hawkesbury LGAs (Morris and Britton 2000)***

A heritage study of *Colonial Landscapes of the Cumberland Plain and Camden* was undertaken by Morris and Britton (2000). The study included a survey of selected pre-1860 cultural landscapes in the region. Early colonial landscapes are considered to be significant and they demonstrate the interaction between early European settlers with the Australian landscape. A number of potential heritage items relating to landscape heritage such as colonial farm estates in Mulgoa and Penrith were included in the study; however, none of these are located within the current study area.

***The Penrith Heritage Study (Thorp 1986)***

An earlier Penrith Heritage Study was undertaken by Thorp (1986). The study outlines a historical context for the Penrith region focussing predominantly on Penrith and St Marys. Five phases of development for the region were outlined comprising:

- 1789-1840: Discovery, exploration and the early settlement
- 1840-1863: Collapse and seeds of change
- 1863-1914: Expansion, subdivision and consolidation
- 1914-1939: Hiatus
- 1939-1986: New growth.

Thorp (1986:51) noted that the new growth period, in which new industry and military presence created a housing demand, resulted in the development of large rural areas. This has impacted on remnants of old farms and orchards, such as old tracks, roads and agricultural plantings.

The report lists 47 heritage items in the suburb of Mulgoa which is located in the north-west of the study area. However, full addresses and/or property identifiers are not provided for the items in the report version available to the consultant for this current assessment.

The report outlines the types of historical sites present in the Penrith study area which includes service sites for the provision of particular services such as water. Irrigation areas created in the 1890s are listed as one of these site types. As well as dams, reservoirs, weirs and floodgates, a series of canals were also excavated. Thorp (1986:93-96) noted that these are still visible on the ground as a landscape modification.

### 3.2.2 Heritage register search results

A search of all available non-Aboriginal heritage registers was undertaken to identify heritage places within or immediately adjacent to the project (ie the study area). The following registers were searched using a combination of online databases and where available using spatial data in Global Information System format by Jennifer Chandler on 13 January 2016:

- NSW State Heritage Inventory
- NSW State Heritage Register (SHR)
- Roads and Maritime section 170 Heritage and Conservation Register
- National Trust of Australia (NSW) Register
- Register of National Estate (RNE)
- Commonwealth Heritage List (CHL)
- National Heritage List (NHL)
- World Heritage List
- Penrith Local Environmental Plan 2010 (PLEP)
- LLEP.

There are two registered heritage items within the study area - Lawson's Inn site is listed on the LLEP, and Orchard Hills Cumberland Plain Woodland is listed on the CHL and RNE. The CHL listing includes reference to evidence of canals associated with the Chaffey Brothers irrigation scheme. There are no items listed on the SHR, section 170 registers, National Trust register, NHL or World Heritage List, within the study area. A list of registered heritage items located within the project is presented in **Table 3-2**. **Table 3-3** lists registered heritage items located within 500 m of the project. The registered heritage items considered as part of this impact assessment are mapped in **Figure 3-4**.

Table 3-2 : Registered historical heritage items within the project

Heritage item name	Register	Number	Significance	Location
Lawson's Inn site (former 'The Thistle' site)	LLEP	53	Local	2155 The Northern Road, Luddenham. Lots 1 and 2 DP 851626
Orchard Hills Cumberland Plain Woodland	CHL RNE	105317 102211	Commonwealth	The Northern Road, Orchard Hills

Table 3-3 : Registered heritage items within 500 m from the project

Heritage item name	Register	Number	Significance	Location
Willmington Reserve	LLEP	50	Local	17 Jamison Street, Luddenham Lot 7004, DP 93052
Luddenham Progress Hall	PLEP	119	Local	The Northern Road, Luddenham
Luddenham Uniting Church	PLEP	120	Local	The Northern Road, Luddenham
St James Anglican Church and Cemetery	PLEP	122	Local	The Northern Road, Luddenham

Heritage item name	Register	Number	Significance	Location
Vicary's Winery Group, including woolshed, slab horse shed, land area and main house and garden	LLEP	51	Local	The Northern Road, Luddenham. Part Lot 1, DP 838361
Luddenham Public School	LLEP	52	Local	The Northern Road, Luddenham. Lot 1, DP 194409
Scarred Tree and Aboriginal artefact scatter	PLEP	878	Local	Lot 200, Bradley Street, Glenmore Park Lot 200, DP 1162982

### 3.2.3 Review of aerial imagery

Current aerial imagery was viewed to identify areas of heritage potential prior to the field survey. A number of properties were identified where the nature of visible features or buildings were unable to be identified and may have some heritage potential. These identified areas formed the basis of the focus of the field survey.

Subsequent to the field surveys in February and April 2016, the project construction footprint was revised adding new areas for assessment. A desktop assessment of these new areas, including review of aerial imagery, background information and consideration of field results from other areas already assessed in the vicinity was undertaken. No areas were identified as having potential for previously unidentified heritage items during the desktop assessment. Two new study areas were situated within the heritage boundary of the Warragamba Dam to Prospect Reservoir pipeline. These two new areas were surveyed together with an additional two new areas associated with drainage works at the pipeline site. The survey results are included in **Section 4**.

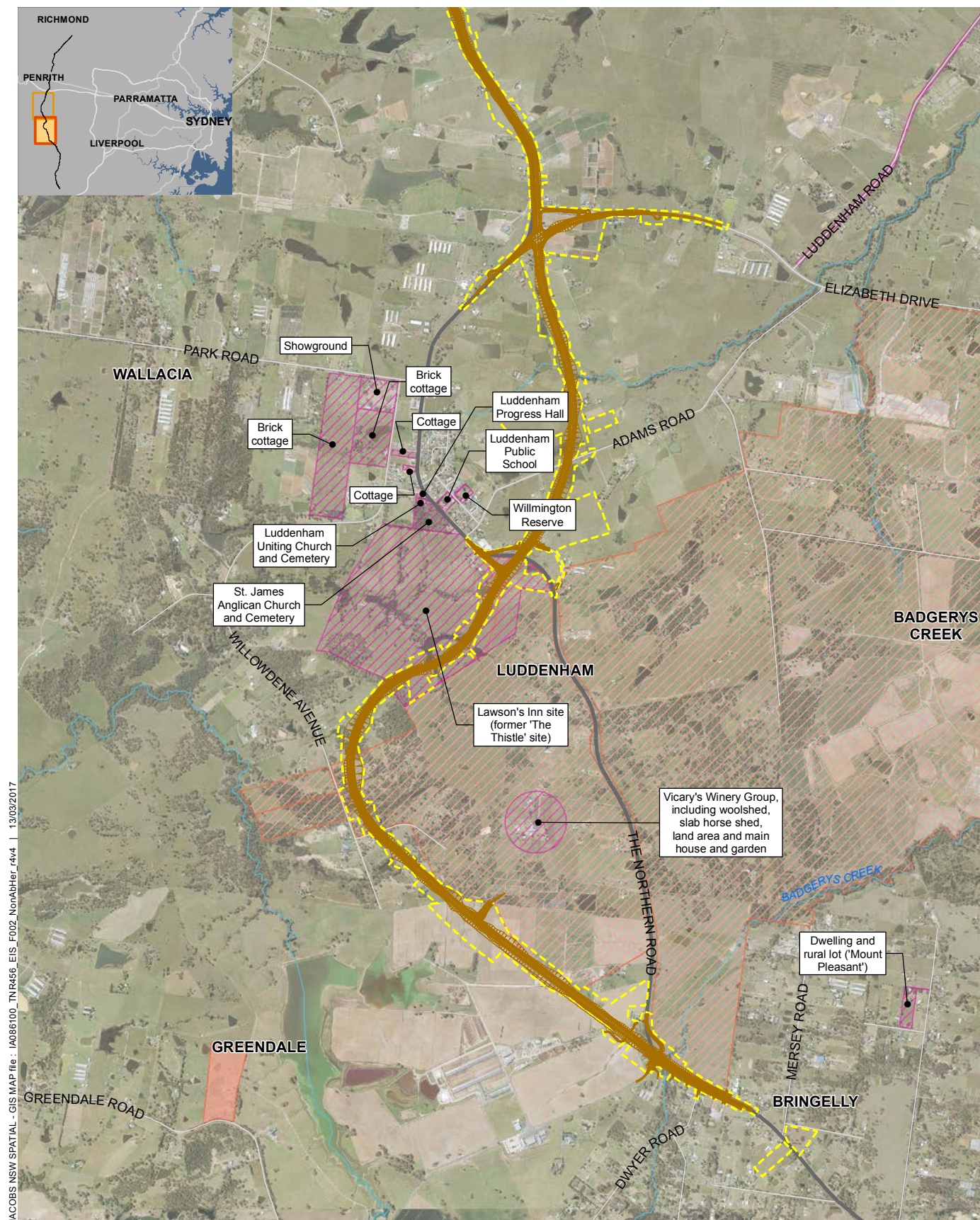
### 3.2.4 Summary

Previous studies and heritage register searches have indicated that there are two registered heritage items located within the project construction footprint (Lawson's Inn site and the Orchard Hills Cumberland Plain Woodland). A previous heritage assessment identified two previously nominated but unlisted heritage items (The Northern Road, and the Warragamba Dam to Prospect Reservoir pipeline) and two previously nominated heritage items relating to rural landscape in the west of the Orchard Hills locality and along The Northern Road. There are no registered heritage items immediately adjacent to the project. One heritage item, The Northern Road alignment, identified in a previous report is located immediately adjacent to the project. Those registered heritage items situated within 500 m of the project (**Table 3-3**) are a sufficient distance from the construction footprint to be unlikely to be impacted by the project, and are therefore not considered further in this assessment.

There is the potential for previously unidentified historical heritage items to be situated in the study area, based on the review of aerial imagery, and the nature of the previous heritage assessments which included limited field survey. Following a search of the above registers, and review of the previous literature, historical background and aerial imagery, the following types of historical heritage items are likely to be found in the study area:

- Houses, homesteads and other buildings associated with the settlement of the region
- Past rural uses related to agriculture and orcharding, including stockyards, fences, sheds and outbuildings, orchard trees, and wells.

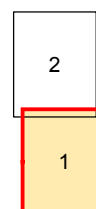




JACOBS NSW SPATIAL - GIS MAP file : JA086100\_TNR456\_EIS\_F002\_NonAbhler\_r4v4 | 13/03/2017

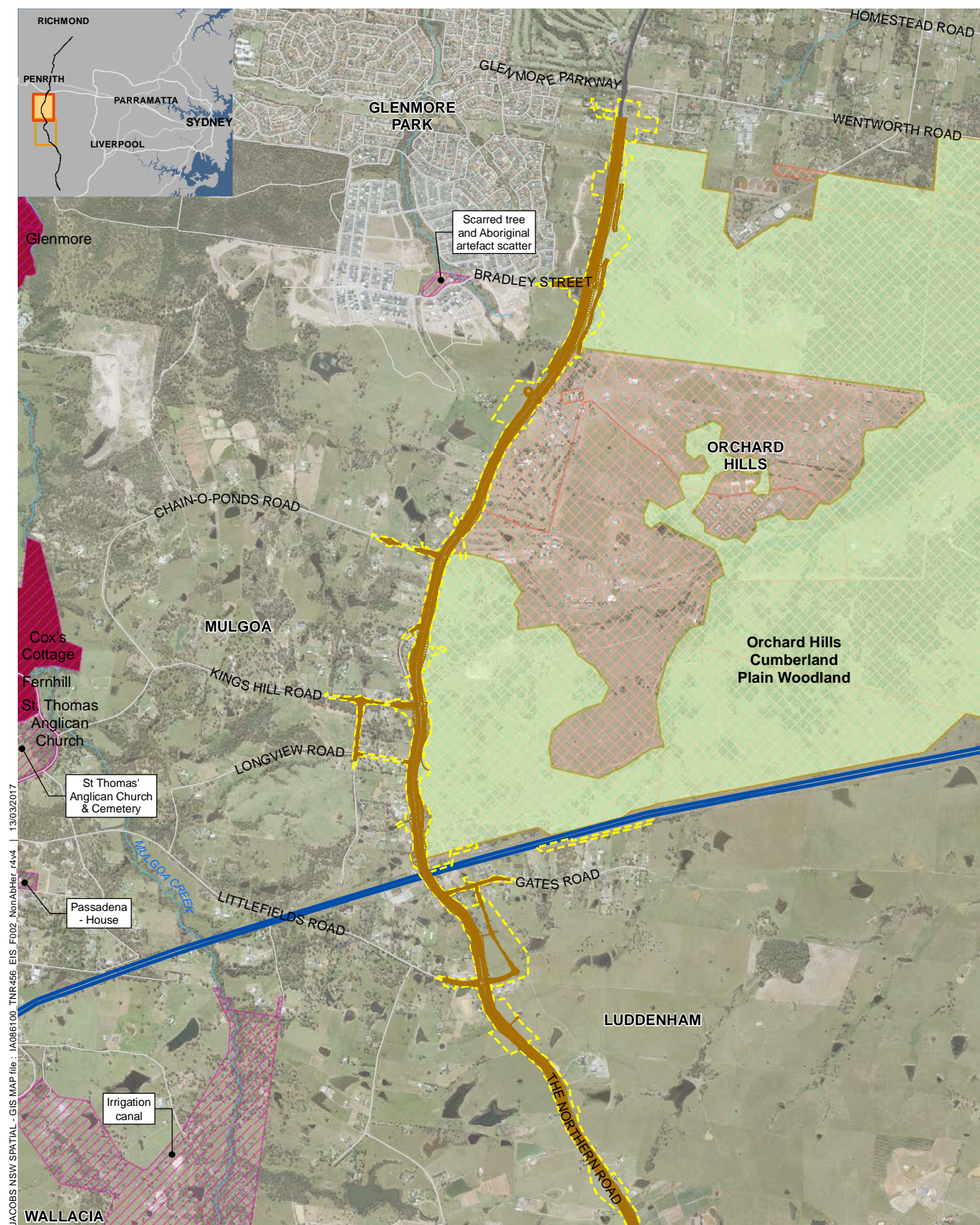
- The Northern Road upgrade - Mersey Road to Glenmore Parkway
- The Northern Road (Existing)
- Construction footprint
- Local heritage items
- Commonwealth Heritage
- State Heritage
- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)
- Commonwealth Lands

0 0.5 1 km



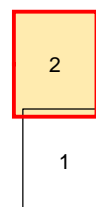
**Figure 3-4** | Registered historical heritage items located within the study area





- |   |   |
|---|---|
| The Northern Road upgrade - Mersey Road to Glenmore Parkway | Local heritage items                                    |
| The Northern Road (Existing)                                | Commonwealth Heritage                                   |
| WaterNSW supply pipelines                                   | State Heritage  |
| Construction footprint                                      | Western Sydney Airport site (Commonwealth Land)         |
|   | Defence Establishment Orchard Hills (Commonwealth Land) |
|   | Commonwealth Lands                                      |

0 0.5 1 km



**Figure 3-4** | Registered historical heritage items located within the study area



## 4. Field survey

### 4.1 Methodology

Prior to undertaking the historical heritage field survey, priority areas were identified using background information including aerial images, the predictive statement for historical site types, previous studies and field surveys, and historical heritage register listing. This provided a summary of target areas for survey.

The field survey was undertaken on 23-26 February and 5-6 April 2016 by Amanda Goldfarb (Project Archaeologist, Jacobs) and Jennifer Chandler (Project Archaeologist, Jacobs). The field survey areas were inspected on foot where grass was not long and there was access to the property. Some vehicle survey was also undertaken where grass was long and the property was large in size. In some cases the properties were viewed from the fence only.

A field survey of four additional areas relating to drainage works in the vicinity of the Warragamba Dam to Prospect Reservoir pipeline was undertaken on 20 September 2016 by Andrew Roberts (Senior Archaeologist, Jacobs). Photographs were taken of each survey area and notes made regarding relevant description and condition details. Mapping of features located during the surveys were undertaken using a DGPS Unit (Trimble® GeoXH™ GeoExplorer®) using GDA94/MGA55 for Eastings and Northings.

### 4.2 Limitations

Long grass and hot weather impacted on the field survey as there was very poor ground surface visibility and snake risk so some areas were not surveyed comprehensively, as follows:

- Lot A DP341629 and Lot A DP341893 (Survey area no. 3S-5) were viewed from the fence as there was no access to the properties. However, the location of the pipeline was able to be determined
- Lot 1 DP851626 (Survey area no. 4-16A) was surveyed by vehicle as there was very long grass present across the entire property
- Lot 21 DP258581 (Survey area no. 4-18) was not surveyed although a review of the aerial imagery indicated that there were no potential heritage items on the property.

Metadata for the spatial data used for calculations in this report is identified in Appendix A. The reliability of calculations provided in this report is limited to the reliability of that data.

Based on the large volume of current and relevant information available for the Orchard Hills Cumberland Plains Woodland CHP, the assessment of natural heritage values was prepared at a desktop level using existing information as outlined in Section 3.3 above. No additional field work was conducted in preparing the natural heritage assessment.



### 4.3 Results



The results of the historical heritage items known prior to survey are listed in **Table 4-1**. The detailed description, history and significance assessment are presented in **Section 5**. Targeted survey areas with potential for heritage items are listed in **Table 4-2** and mapped in **Figure 4-22**. Where potential heritage items were identified during survey, this is noted in the results, with more detailed information and significance assessment provided in **Section 5**.



Table 4-1 : Known historical heritage items surveyed

Location	Item name	Date surveyed	Results of survey
Lot A DP341629	Warragamba Dam to	23/02/16	Survey undertaken from outside the gate on The Northern Road as access was restricted. Large steel pipeline on east/west alignment.



Location	Item name	Date surveyed	Results of survey
Lot A DP341893	Prospect Reservoir pipeline		<p>Located underground at The Northern Road and emerges from ground about 100m from The Northern Road. This is a potential heritage item. A concrete aggregate slab in line with the pipeline is located in the road reserve. A circular piece of concrete is adjacent to the slab. This is not a potential heritage item.</p>  <p>Figure 4-1 : Pipeline, facing east. Photo taken by Jennifer Chandler from gate on The Northern Road on 23/02/16.</p>  <p>Figure 4-2 : Concrete slab, facing west. Photo taken by Jennifer Chandler on 23/02/16.</p>
2181 The Northern Road, Mulgoa Lot 3 DP238092	Orchard Hills Cumberland Plain Woodland (Chaffey Brothers Irrigation Scheme Canal)	06/04/16	<p>Limited access to property so only canal (Chaffey Brothers Irrigation Scheme Canal) was surveyed. Canal traverses the property from the Warragamba Dam to Prospect Reservoir pipeline in the south, to an area opposite Grover Crescent in the north. Two canals side by side in some places with the westernmost canal a lot shallower. Two wooden features possibly related to the operation or construction of the canal were noted in the southern section, although they are outside the current construction footprint.</p>

Location	Item name	Date surveyed	Results of survey
			 <p>Figure 4-3 : Canal at northern end, facing north-east. Photo taken by Jennifer Chandler on 6 April, 2016.</p>
Lot 21 DP614481	Chapel and school site	25/02/16	<p>Identified in previous heritage study as having been the former site for a chapel and school. Modern houses are present on the site. The house within the construction footprint has cement sheeting and stumps. A row of palm trees is adjacent to the driveway and appear to be around 50 years old. Grassed triangular block to east of house was examined. Old fence adjacent to more modern one (timber and barbed wire). 0-5% ground surface visibility. No potential heritage items.</p>  <p>Figure 4-4 : Chapel and school site, facing west. Photo taken by Jennifer Chandler on 25/02/16.</p>
Lot 1 DP90157 26 Adams Road, Luddenham	Wells, stone gatepost and road cutting	25/02/16	<p>Identified in previous heritage study as having some heritage features, such as wells. Cleared grassed paddock. Pieces of stone (squares/blocks) near the gate on Eaton Road and scattered across the paddock. A depression with stone blocks and wooden planks is about 100m north-east of the gate. The feature appears to be what was described in the previous heritage report as a well. A second feature is located about 20 m south-west of the first. It contains stone blocks on the edges of a depression. Both wells are filled. No well capping is visible, although the second well (south-west of first well) has stone rubble over the top. Paddock is used for cattle grazing. A cutting and possible gate post blocks listed in the previous heritage report were also observed.</p> <p>5% ground surface visibility.</p>

Location	Item name	Date surveyed	Results of survey
			 <p>Figure 4-5 : First well feature, facing north-east. Photo taken by Jennifer Chandler on 25/02/16.</p>  <p>Figure 4-6 : Second well feature, facing north-east. Photo taken by Jennifer Chandler on 25/02/16.</p>
Lot 2 DP623457	Identified in several heritage reports as being the actual location for Lawson's Inn (not the LEP listed location).	26/02/16	<p>Currently used to grow trees for Christmas tree business. There are currently rows of small trees and grass between rows has been recently slashed. Limited ground surface visibility. Fragments of glass and ceramic were found in a scatter 50 m x 2 m with a maximum density of about 2 per square metre. Glass appeared to be late 19th/early 20th century. Scatter was located in the north of the block, near Eaton Road. Stone blocks, which had been painted white, indicating a vehicle path, were found in centre of property.</p> <p>The property is adjacent to Eaton Road, The Northern Road former alignment.</p>







Location	Item name	Date surveyed	Results of survey
			 <p>Figure 4-7 : Assumed location of Lawson's Inn, facing north. Photo taken by Jennifer Chandler on 26/02/16.</p>
2215 The Northern Road, Luddenham Lots 1 & 2 DP851626	Lawson's Inn site (LEP-listed location). This location is not historically correct.	26/02/16	This large block was heavily grassed and had a series of undulating rises with a drainage line cutting through the centre. Where the drainage line meets a dam, there is a cluster of trees (peppercorn and eucalypt). The peppercorn trees were noted in the LEP listing for Lawson's Inn, however, no remains of the inn were located. The peppercorn trees were over 200 m from the current alignment of The Northern Road. Thick long grass across the property. Vehicular and pedestrian survey was undertaken over most of the area. 20th century dairy remains were located near The Northern Road. No historical features were identified. Visibility was 0%.
Grover Crescent, Eaton Road and driveway of Lot 502 DP580982	Remnants of The Northern Road	23/02/16 24/02/16 25/02/16	The three sections that were potentially remnants of The Northern Road were surveyed as part of these survey areas: Chapel and school site, 3S-3, 4-2 (detailed above and below).

Table 4-2 : Other survey areas



Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
3S-2	Lot 1 DP224861	23/02/16	Paddock located on slope. Grassed area with metal piles lying in the middle of the paddock. Used for grazing. No potential heritage items were identified. 0-5% ground surface visibility.
3S-3	Lot 1 DP569729	23/02/16	Located between a small private road and The Northern Road. Property has timber fencing (post and rail) and scattered trees. The house and sheds on the block are modern. The public road (Grover Crescent) is the old alignment of The Northern Road and is thus a potential heritage item.



<sup>1</sup> Survey Area No. was allocated according to design plans and project stage numbering for the project at the time of the survey and reflects the order that the areas were visited by the consultants.

Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
			 <p>Figure 4-8 : Grover Crescent, facing south. Photo taken by Jennifer Chandler on 23/02/16.</p>
3S-4	Lots 41 & 42 DP878814	23/02/16	Paddock/proposed road between Kingshill Road and Longview Road. Viewed from road, trees present and grass cover. No potential heritage items identified.
3S-5	Lot A DP341629 Lot A DP341893	23/02/16	Details in <b>Table 4-1</b> above for Warragamba Dam to Prospect Reservoir pipeline
3S-6	Lot 3 DP238092	06/04/16	Details in <b>Table 4-1</b> above for Orchard Hills Cumberland Plain Woodland.
3S-7	Lot 1 DP420840	23/02/16	Area is cleared and grassed with some clay surface visible. 20% ground surface visibility. No potential heritage items identified.
3S-8	Lot 23 DP207317	23/02/16	<p>An orchard containing pear/apple trees is at the back of the property. One row and a few partial rows of trees. Age is uncertain. Modern Colourbond shed and 1970s-1980s house. More fruit trees to the south-east of the house and cypress trees near the road. Potential heritage item.</p>  <p>Figure 4-9 : Orchard, facing east. Photo taken by Jennifer Chandler on 23/02/16.</p>

Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
			 <p>Figure 4-10 : Orchard, facing south. Photo taken by Jennifer Chandler on 23/02/16.</p>
3S-9	Lot 1 DP109697	23/02/16	Located in large paddock with two dams. A few scattered trees. No potential heritage items identified. 0% ground surface visibility.
3S-10	Lot 2 DP202647	24/02/16	Mid-20 <sup>th</sup> century house located at the front of property adjacent to The Northern Road. House is constructed of cement sheeting with gabled corrugated iron roof. Rusted gutters. Louvre glass windows. Four water tanks (3 corrugated, 1 Colorbond). House is vacant and in poor condition. White painted wrought iron doors. House is on brick stumps. Timber weatherboards on south side of house at verandah. Timber present on side of roof. Separate structure to south of house, also cement sheeting. Roof is hipped, also corrugated. No potential heritage items identified.
3S-11	Lot s 9 & 10 DP26658	26/02/16	Located in Transgrid easement. Area is cleared and slopes up to the west. Swampy area near the Northern Road. Old pipes and a bathtub are present. Grass was long over 80% of the property with remaining areas slashed. Visibility was 0%. No potential heritage items identified.
4-1	Lot 1 DP109697	23/02/16	Undulating paddocks with a dam in the middle of the lot. A small group of trees is located to the west of the dam comprising four exotic trees and a cypress tree. Unable to access this area closer. Thick ground cover. 0% ground surface visibility. No potential heritage items identified.
4-2	Lot 502 DP580982	24/02/16	Historical information was provided by the current owner Malcolm Turner on 24 February 2016: Property contains slab hut, late 19 <sup>th</sup> century weatherboard house, old alignment of The Northern Road. There was a coolstore/dairy at the back of the property and another building located to the north-west of the house. The whole place is a potential heritage item.




Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
			 <p>Figure 4-11 : House, facing south. Photo taken by Jennifer Chandler on 24/02/16.</p>  <p>Figure 4-12 : Driveway which used to be Bringelly Road, facing south-east. Photo taken by Jennifer Chandler on 24/02/16.</p>
4-3	Lot 1 DP200435	24/02/16	Viewed property from outside property fenceline. House appears modern on cleared and grassed block with a few scattered trees. Row of immature pines to rear and south-east of house. Dam and crops in south-east corner with sheds. 5% ground surface visibility. No potential heritage items identified.
4-4	Lot A DP160890	24/02/16	Located on a bend of The Northern Road. Old house (mid-late 19 <sup>th</sup> century) constructed from timber and stone. Hipped roof made from corrugated iron. Verandah out front with carport addition. Additional structure to rear of house has gabled roof and a chimney. Cream walls and green painted roof. To the south there is a green painted corrugated shed (19 <sup>th</sup> century). Shed has timber beams and rafters. Shed is dilapidated in places. Beams are hand sawn. Potential animal run in the southern section of the shed. Stockyards are located next to the front of the shed. Owner (Maurice Pace, pers comm, 24/02/16) said that he bought the property in 1960 and was told the house and shed were 100 years old at that time. Potential heritage item.

Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
			 <p>Figure 4-13 : View of house, facing northwest. Photo taken by Jennifer Chandler on 24/02/16.</p>  <p>Figure 4-14 : View of shed and stockyards, facing south-west. Photo taken by Jennifer Chandler on 24/02/16.</p>
4-5	Lot 3 DP32026	24/02/16	Modern farm house and stockyards. One large saw is on the block, but power operated. 5-10% ground surface visibility. No potential heritage items identified.
4-6	Lot 1 DP517853	24/02/16	Modern farm buildings. Christmas tree farm. 10% ground surface visibility. No potential heritage items identified.
4-7	Lot 100 DP846962	24/02/16	<p>'Pleasantview' homestead. Three houses on property. Westernmost one is located within the construction footprint. Owner (Kenneth Hughes (pers. comm. 24/02/16) stated that this house was moved to site prior to 1930s-1940s and was the previous Llandilo public hall. The building is constructed from timber and has a modern roof, brick chimney. The house roof was damaged in a storm. New steel bars and slab in place for a new shed. Cement sheeting and louvre windows on west side of house.</p> <p>The original 'Pleasantview' homestead is located about 30 m to the east of the construction footprint boundary. There is an old house and several buildings which the owner (Kenneth Hughes pers. comm. 24/02/16) informed us was an old dairy. There is an old rusted dairy vessel located outside one of the sheds. The house is made from timber and brick with a corrugated iron roof. The sheds are made from</p>

Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
			<p>timber and corrugated iron. One shed has an old petrol pump located out the front. There is a lot of old farm machinery, a car and a truck located amongst the buildings. Potential heritage item.</p>  <p>Figure 4-15 : House located within the project footprint at 'Pleasantview' property. Photo facing north-east. Photo taken by Jennifer Chandler on 24/02/16.</p>  <p>Figure 4-16 : Original house at 'Pleasantview', facing south. Photo taken by Jennifer Chandler on 24/02/16.</p>





Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
			 <p>Figure 4-17 : Outlying building, facing west. Photo taken by Jennifer Chandler on 24/02/16.</p>
4-8	Lot 3 DP8272233	24/02/16	Land is sloping south up to telecommunications tower at highest point. Grassed and cleared paddocks. Used for grazing with a dam and storage container. No potential heritage items identified. 0-5% ground surface visibility.
4-9	Lot 2 DP519034	24/02/16	Land sloping down south from telecom tower at highest point. Dam and pump shed at lowest point. An old corrugated iron shed is also present (about 10x5 m). Shed has wooden studs and cross beams and is close to Adams Road. Grass was hip-high in paddock and weather hot, so close up survey of shed was not conducted due to risk of snakes. 0% ground surface visibility. No potential heritage items identified.
4-10	Lot 104 DP846962	24/02/16	Modern house located on crest of rise. Grassed and cleared with exotic tree species and some native vegetation. Some old gable roofed sheds at back of property which is outside the project footprint. 5% ground surface visibility. No potential heritage items identified.
4-11	Lot 2 DP250030	24/02/16	Modern house on sloping land. 0% ground surface visibility. No potential heritage items identified.
4-12	Lot 21 DP614481	25/02/16	Details in <b>Table 4-1</b> above for Chapel and School site.
4-13	Lot 1 DP90157	25/02/16	Details in <b>Table 4-1</b> above for wells, stone gatepost and road cutting.
4-14	Lot 1 DP250030	25/02/16	Cleared and grassed paddock used for cattle grazing. Modern house with sheds and cattle yard at rear. A drainage channel with depression is next to the house yard and has star pickets around it. No potential heritage items identified.
4-15	Lot 2 DP623457	26/02/16	Details in <b>Table 4-1</b> above for property identified in several heritage reports as being the actual location for Lawson's Inn (not the LEP listed location).
4-16A	Lot 2 DP851626	26/02/16	Details in <b>Table 4-1</b> above for Lawson's Inn site (LEP-listed location). This location is not historically correct.
4-16B	Lot 1 DP851626	05/04/16	Details in <b>Table 4-1</b> above for Lawson's Inn site (LEP-listed location). This location is not historically correct.



Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
4-17	Lot 20 DP258581	25/02/16	Land used for market gardens and cattle grazing. Land slopes up to a crest at the eastern end of the block. Knee high grass. House occupant stated that he had not seen anything historical on the property (pers. comm. 25/02/16). 0% ground surface visibility. No potential heritage items identified.
4-18	Lot 21 DP258581	25/02/16	Access to property denied. Very little visible from road. A review of aerial imagery indicated that there were no potential heritage items.
4-19	Lot 22 DP258581	25/02/16	Area is largely cleared with very long grass and some native vegetation. Old house site located on top of the rise outside the project footprint. House has been demolished recently. Land manager (Pam <sup>2</sup> , pers. comm. 25/02/16) said that it was an old property. Spruce and peppercorn trees present, indicating an older garden but no evidence of any related dwellings or structures. Area in study area is flat. 0% ground surface visibility. No potential heritage items identified.
4-20	Lot 33 DP259698	25/02/16	Paddocks with knee-high grass and thick immature native vegetation. The area to the south has a steep gully, while to the north there was a dam. House occupant (pers. comm. 25/02/16) said that there were no heritage items that he knew of. 0% ground surface visibility. No potential heritage items identified.
4-21	Lot 28 DP259698	25/02/16	Area was viewed from road, outside property boundary. Area is located under powerline easement and is largely cleared with some native vegetation. The house and outbuildings are modern. A natural gully is located in the east of the block. Area is heavily treed. Grass is long in places. 0-5% ground surface visibility. No potential heritage items identified.
4-22	Lot 27 DP259698	25/02/16	Modern house and outbuildings. There is a scatter of debris around the dam to the south and east of the property. Terracotta piping, ceramic and glass was noted. Some of it appears to be late 19 <sup>th</sup> /early 20 <sup>th</sup> century. It is uncertain how old the piles of debris are. The property owner said the soil was brought in to fill in the natural gully – recent fill. Patches of 100% ground surface visibility on and near piles of debris. No potential heritage identified as the fill was brought into the property and the age was unable to be established.
4-23	Lot 1 DP71367	26/02/16	Old style house on corner of Adams Road and The Northern Road. Located outside, but close to construction footprint (about 30 m). Old weatherboard/cement sheeting house with green painted corrugated roof. Weatherboard is cream in colour. House is occupied and surrounded by a hedge. The house is a potential heritage item.
4-24	Lot 11 DP1092165	26/02/16	Old tractor and machinery on display at front of property and located within Crown land (The Northern Road reserve). Property is a modern dairy business – Leppington Pastoral Co. Pty Ltd. The dairy manager (pers. comm. 26/02/16 <sup>3</sup> ) stated that all the buildings and infrastructure on the block were built in the last 50 years. Area has sheds, houses and paddocks. All infrastructure appears modern. Manager also said he had not seen anything that appeared historical on property. 25-50% ground surface visibility. Old tractor is reflective of people's relation to farming in the area but it's origin and history is unknown and is not

<sup>2</sup> No surname provided.

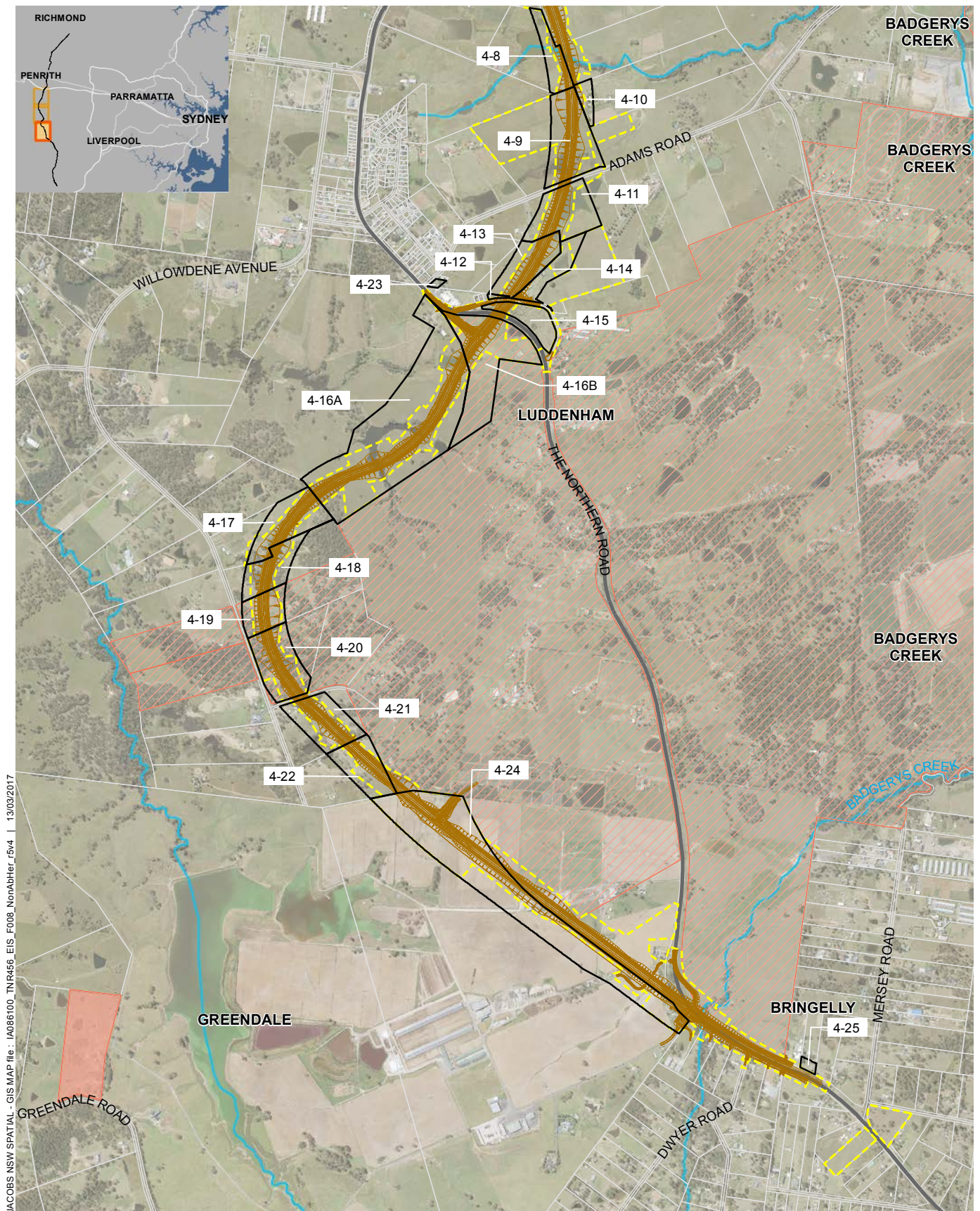
<sup>3</sup> Name not provided.

Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
			<p>likely to be in its original location or context. No potential heritage items identified.</p>  <p>Figure 4-18 : Machinery outside property on road reserve, facing east. Photo taken by Jennifer Chandler on 26/02/16.</p>
4-25	Lot 2 DP250684	26/02/16	<p>Old farm machinery on display in front yard of house, however it's origin and history is unknown and is not likely to be in its original location or context. No potential heritage items identified.</p>  <p>Figure 4-19 : Machinery in front yard of property, facing north-east. Photo taken by Jennifer Chandler on 26/02/16.</p>
4-26	Lot 1 DP226972 Lot A DP341629	20/09/16	<p>This survey area is located within the Warragamba Dam to Prospect Reservoir pipeline easement. Soils in the entire area have been disturbed from the construction of the 1950s upgraded pipeline and associated infrastructure and comprises rubble, a mixture of blue gravel and clayey soil. One potential heritage item was noted in this area: a culvert covering a drainage channel which allows access to four concrete building foundations (located approximately 14 m west of the construction footprint).</p>

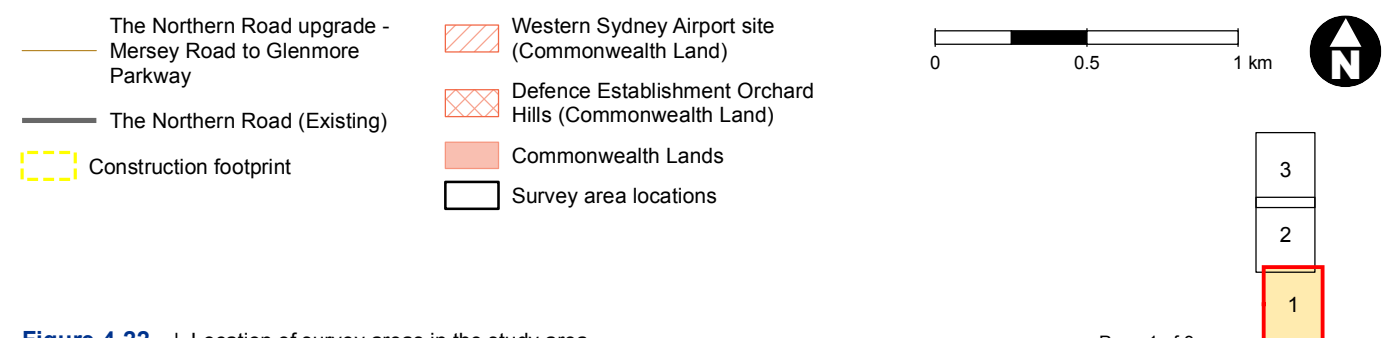


Survey Area No. <sup>1</sup>	Location	Date surveyed	Results of survey
			 <p>Figure 4-20 : Culvert covering a drainage channel, facing north-west. Photo taken by Andrew Roberts on 20/09/16.</p>
4-27	Lot A DP347475 Lot A DP359606	20/09/16	<p>This survey area is adjacent to the Warragamba Dam to Prospect Reservoir pipeline section constructed in the 1940s. The surface of the area comprises redeposited overburden apparently as a result of the construction of the pipeline ditch in this location as it ventured underground directly west of this area.</p> <p>One potential heritage item was noted in this location: a concrete block culvert likely to be associated with the construction of the earlier pipeline.</p>  <p>Figure 4-21 : Concrete culvert, facing north. Photo taken by Andrew Roberts on 20/09/16.</p>
4-28	Lot 2 DP32053	20/09/16	Grassed area on private property. No potential heritage items identified.
4-29	Lot 73 DP2120	20/09/16	Grassed area of private property, viewed from fence. Building debris of unknown origin observed in area. No potential heritage items identified.



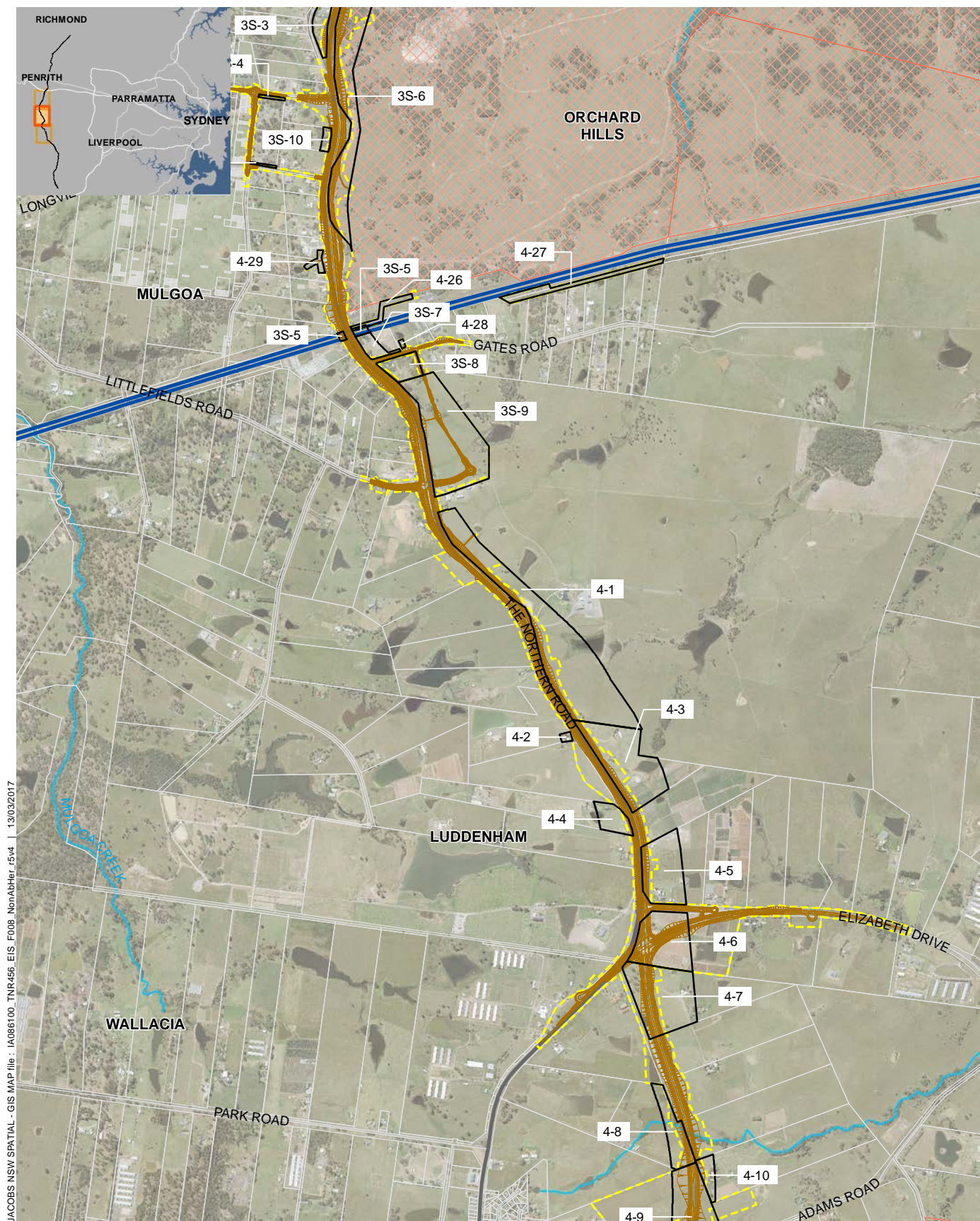


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**Figure 4-22** | Location of survey areas in the study area



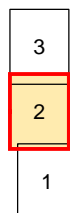


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- The Northern Road upgrade - Mersey Road to Glenmore Parkway
- The Northern Road (Existing)
- WaterNSW supply pipelines
- Construction footprint

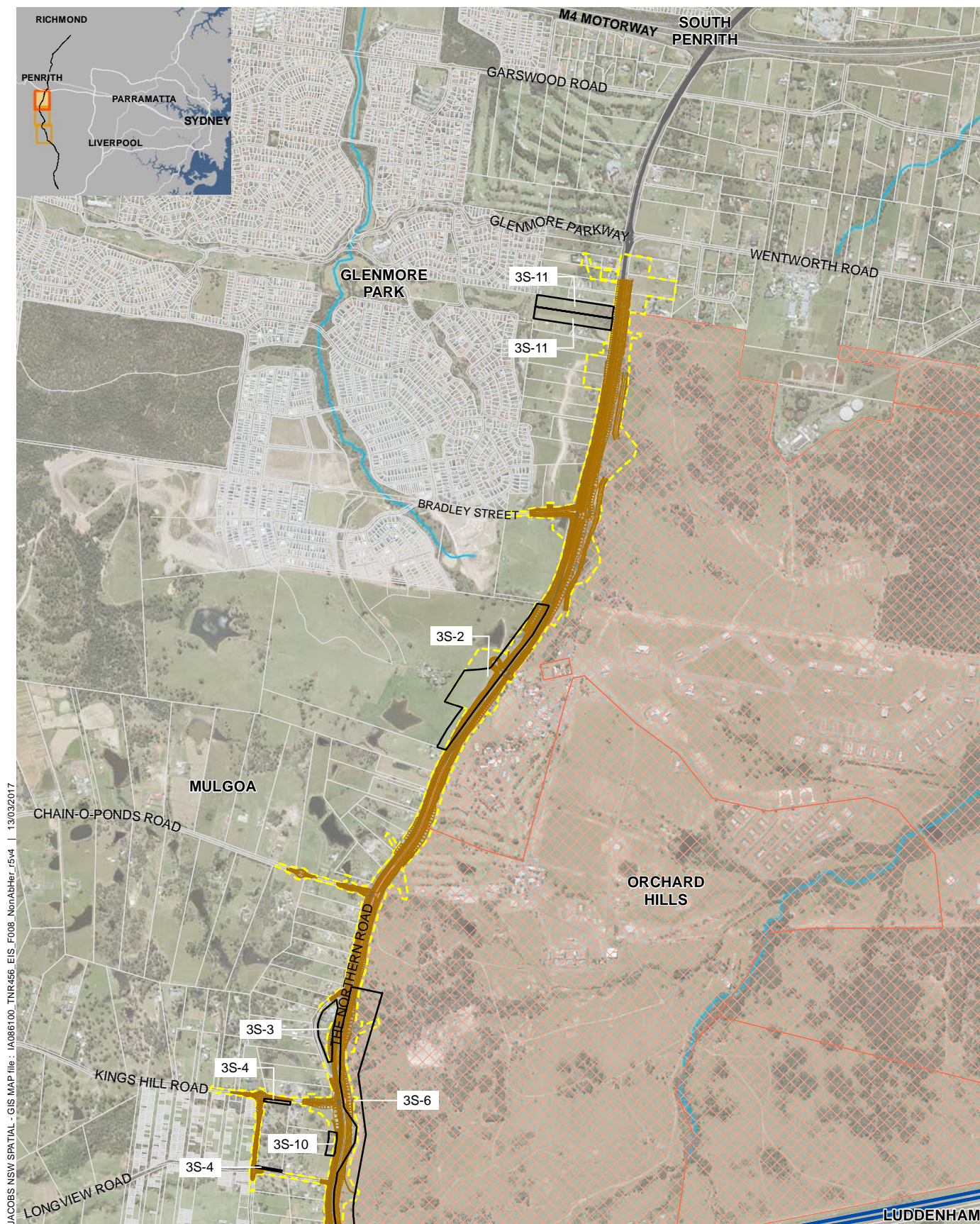
- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)
- Commonwealth Lands
- Survey area locations

0 0.5 1 km



**Figure 4-22** | Location of survey areas in the study area





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- The Northern Road upgrade - Mersey Road to Glenmore Parkway
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0 0.5 1 km



**Figure 4-22** | Location of survey areas in the study area



## 5. Significance assessment

### 5.1 Basis for assessment

The concept of cultural heritage significance helps in estimating the value of places. Places which are likely to be significant are those which 'help an understanding of the past or enrich the present, and which would be of value to future generations' (Australia ICOMOS 2000:12). In Australia, the significance of a place is generally assessed according to the following values:

- Aesthetic value
- Historic value
- Scientific value
- Social value.

The NSW Heritage Council has adopted specific criteria for heritage assessment, which have been gazetted pursuant to the *Heritage Act 1977*. The seven criteria upon which the following assessment of significance is based are outlined below:

- Criterion (a) an item is important in the course, or pattern, of NSW cultural or natural history
- Criterion (b) an item has strong or special association with the life or works of a person, or group or persons, of importance in NSW cultural or natural history
- Criterion (c) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW
- Criterion (d) an item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons
- Criterion (e) an item has potential to yield information that will contribute to an understanding of NSW cultural or natural history
- Criterion (f) an item possesses uncommon, rare or endangered aspects of NSW cultural or natural history
- Criterion (g) an item is important in demonstrating the principal characteristics of a class of NSW cultural or natural places or cultural or natural environments.

Components of the NSW Heritage Manual, published by the NSW Heritage Office and NSW Department of Urban Affairs and Planning (NSW Heritage Office 2001) (now the Heritage Division of the Office of Environment and Heritage (OEH)), sets out a detailed process for conducting assessments of heritage significance. These guidelines have also been used in undertaking this significance assessment.

For places on Commonwealth land, or owned or managed by the Commonwealth Government the Australian Heritage Council assesses whether a Commonwealth place has significant heritage values against the nine Commonwealth Heritage List criteria, as follows:

- Criterion (a) the place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history
- Criterion (b) the place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history
- Criterion (c) the place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history
- Criterion (d) the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:
  - a class of Australia's natural or cultural places; or
  - a class of Australia's natural or cultural environments



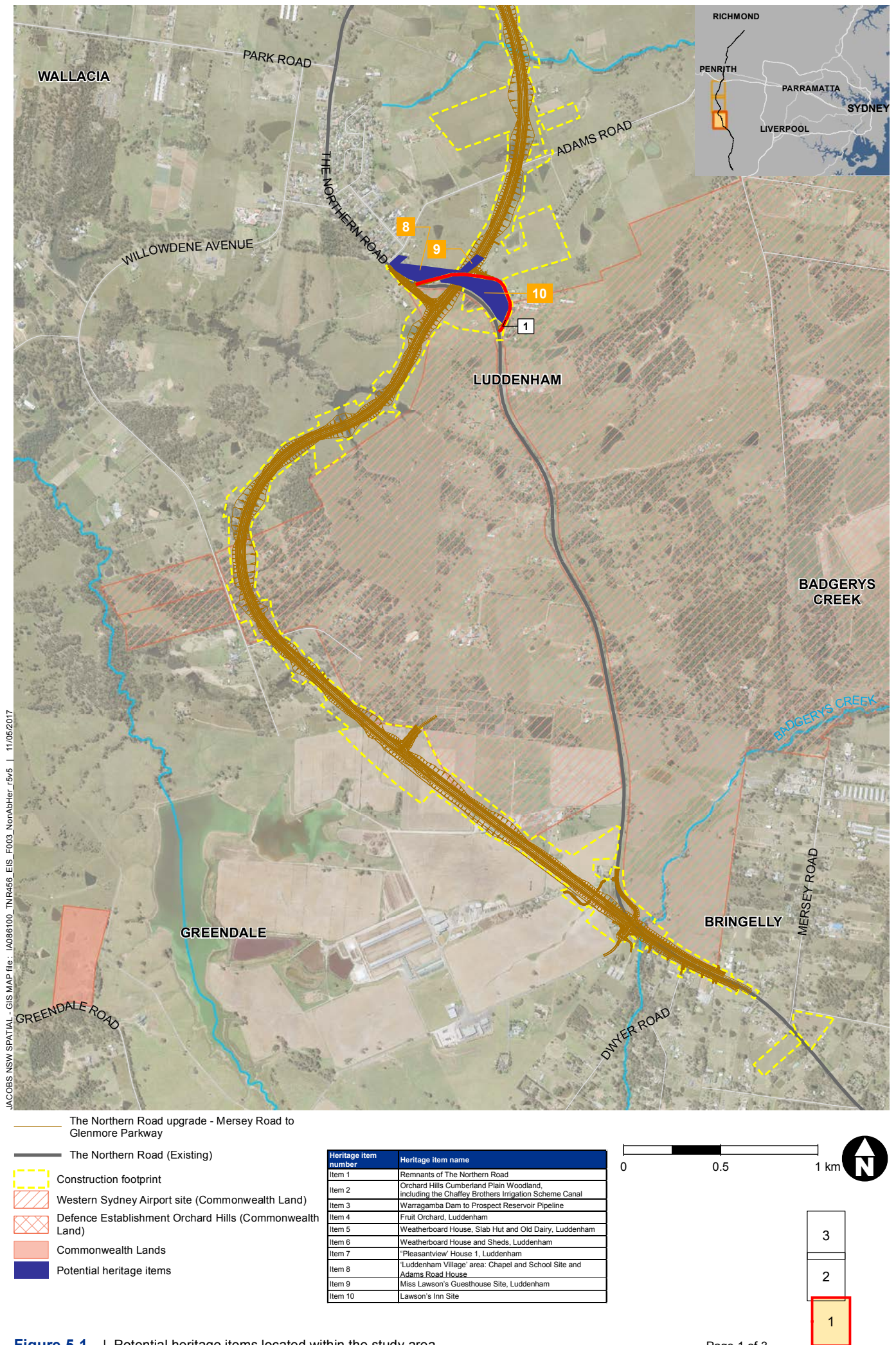
- Criterion (e) the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group
- Criterion (f) the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period
- Criterion (g) the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Criterion (h) the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history
- Criterion (i) the place has significant heritage value because of the place's importance as part of Indigenous tradition.

As well as assessing a place against criteria for its heritage value, the Australian Heritage Council applies a 'significance threshold' test. To reach the threshold for the National Heritage List, a place must have 'outstanding' heritage value to the nation. To be entered on the Commonwealth List, a place must have 'significant' heritage value.

Places on Commonwealth land have been assessed against these criteria.

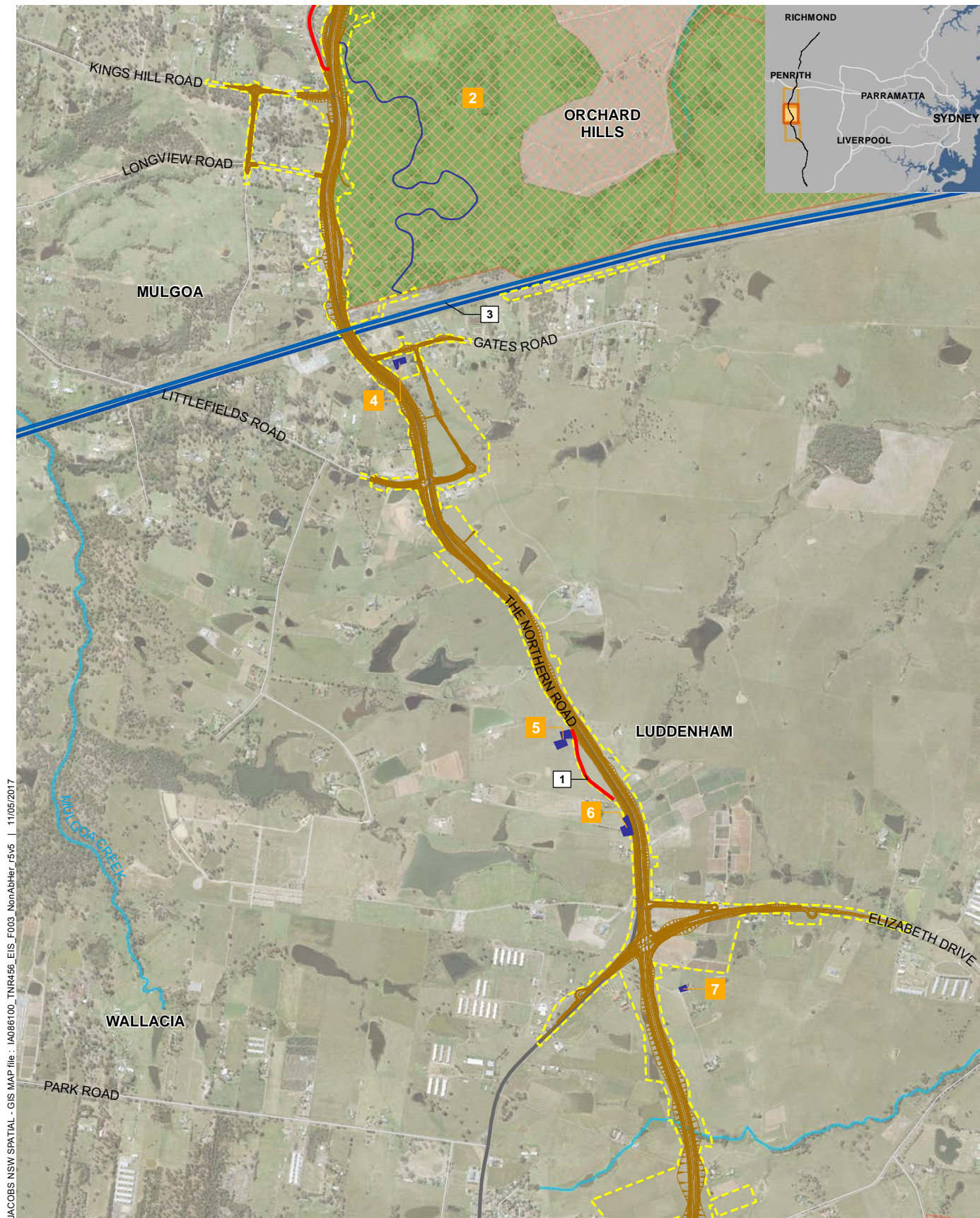
Natural heritage values have also been assessed in relation to the Orchard Hills Cumberland Plain Woodland CHP. These are components of the natural environment that have aesthetic, historic, scientific or social significance, or other special value, for current and future generations. These values lend to a sense of identity and place (ERM 2011).

The potential heritage items considered for this significance assessment are mapped in **Figure 5-1**.



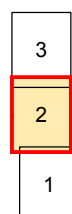
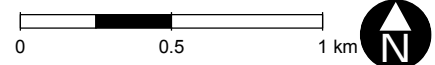
**Figure 5-1** | Potential heritage items located within the study area





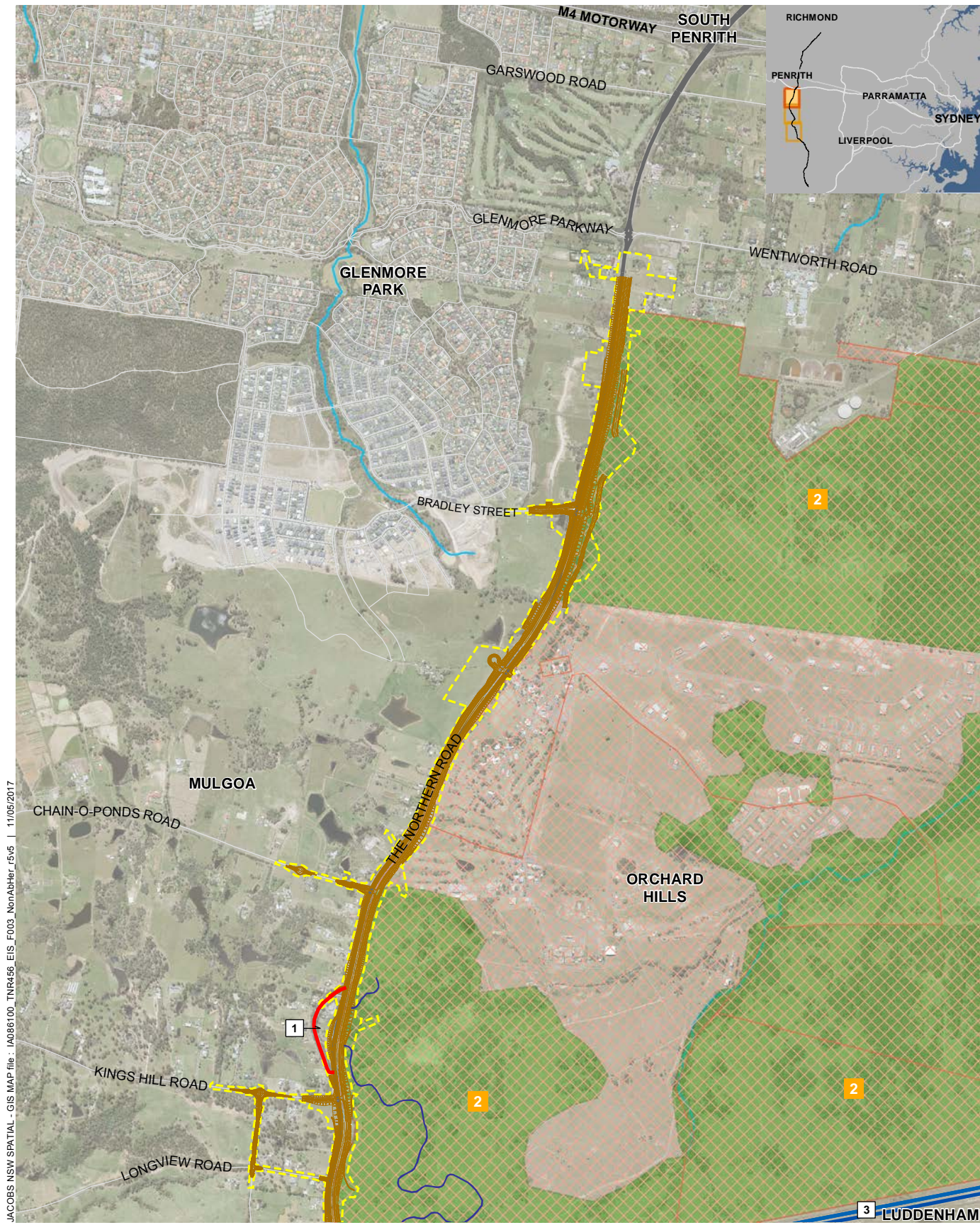
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Heritage item number	Heritage item name
Item 1	Remnants of The Northern Road
Item 2	Orchard Hills Cumberland Plain Woodland, including the Chaffey Brothers Irrigation Scheme Canal
Item 3	Warragamba Dam to Prospect Reservoir Pipeline
Item 4	Fruit Orchard, Luddenham
Item 5	Weatherboard House, Slab Hut and Old Dairy, Luddenham
Item 6	Weatherboard House and Sheds, Luddenham
Item 7	"Pleasantview" House 1, Luddenham
Item 8	"Luddenham Village" area: Chapel and School Site and Adams Road House
Item 9	Miss Lawson's Guesthouse Site, Luddenham
Item 10	Lawson's Inn Site



**Figure 5-1** | Potential heritage items located within the study area

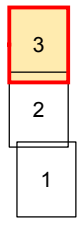
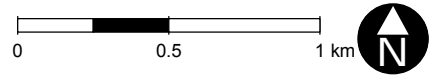




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- The Northern Road upgrade - Mersey Road to Glenmore Parkway
- The Northern Road (Existing)
- WaterNSW supply pipelines
- Construction footprint
- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)
- Commonwealth Lands
- Potential heritage items
- Orchard Hills Cumberland Plain Woodland, including the Chaffey Brothers Irrigation Scheme Canal

Heritage item number	Heritage item name
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Item 8	"Luddenham Village" area: Chapel and School Site and Adams Road House
Item 9	Miss Lawson's Guesthouse Site, Luddenham
Item 10	Lawson's Inn Site



**Figure 5-1** | Potential heritage items located within the study area



## 5.2 Item 1: Remnants of The Northern Road

### 5.2.1 Description and history

The following three old alignments of The Northern Road were identified from previous heritage assessments, discussions with property owners, and parish maps and were surveyed for this current assessment:

- Grover Crescent, Mulgoa (**Figure 5-2**) (Survey area no. 3S-3)
- Driveway of 2785-2787 The Northern Road and to the east of 2789A The Northern Road, Luddenham (**Figure 5-3**) (Survey area no. 4-2)
- Eaton Road, Luddenham (**Figure 5-4**) (Survey area no. 4-15).

Grover Crescent in Mulgoa is currently a bitumen road with housing and paddocks on either side (**Figure 5-5, Figure 5-6**). The section of road out the front of 2785-2787 The Northern Road and to the east of 2789A The Northern Road, Luddenham is currently an unsurfaced driveway (**Figure 5-7**). Eaton Road in Luddenham is currently a bitumen road largely rural in nature (**Figure 5-8**).

An assessment (RPS Manidis Roberts 2015: 143) of The Northern Road was undertaken to the south of the project. The report concluded that The Northern Road alignment to the south of the project *is considered to be significant as one of the earliest roads in the area, predating the subdivision of early land grants in the area*. In addition, a previous archaeological assessment (Artefact Heritage 2015: 44) found that there was potential for early road remnants such as surface treatments, culverts, retaining walls to be located at Eaton Road; however, no areas of archaeological potential or evidence of any of these features were identified during the 2016 field survey by Jacobs. However, no surface treatments, culverts or retaining walls were observed during the field survey in this area.

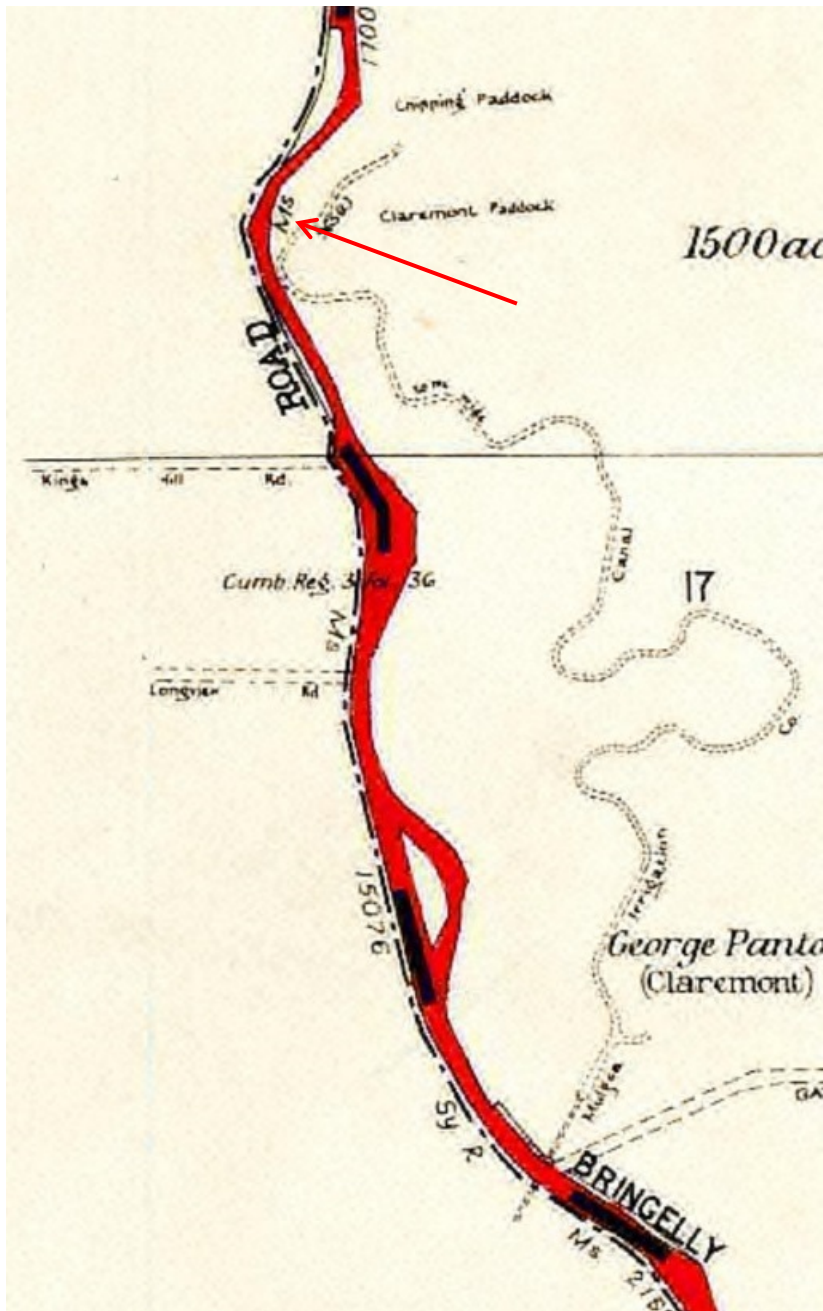
A previous heritage assessment (Paul Davies Pty Ltd 2007) reviewed the earlier nomination of The Northern Road as a potential heritage item. The item was not included on the Penrith LEP in 1991:

The Northern Road was nominated for its historic interest as an early colonial road. While alignment of the road in following a narrow ridgeline continues to be of historic interest the road has been upgraded and roadside margin cleared of trees. The elevation of the road provides impressive views of the Blue Mountains to the west. It is not recommended for listing (Paul Davies Pty Ltd 2007:205).

An article in the Nepean Times (NT) (23 June 1900) describes The Northern Road, or Bringelly Road, as it was called then: 'It is 66ft wide and 2ft. 6in. deep in mud or dust, according to the seasons'. It was originally a public road, but was then owned by Fred Andrews and Co (fuel merchants). The road may have been wider than usual with the article commenting: 'It is a pity this wretched road is so wide – it holds so much slush.' The article states that ideally the road should only be wide enough for [bullock] teams to pass. It appears to have been periodically maintained by trustees but there was a general lack of dedicated maintenance. Money allocated for repairs appears to have been used unwisely: 'Every ratepayer fancies he could do things better than an alderman could, and, whilst we know that the £1200 lately spent on this road was spent injudiciously, we must give the alderman credit for doing their best.' In 1900 there was no ballast in the construction of the road, while other roads 'around Botany' were ballasted at this time.

By 1901 however, the road appears to have improved. For four miles from the corner of the Main Western Road and Bringelly Road in Kingswood the road was in good condition: 'with the exception of the top dressing of gravel and metal, he saw a fairly constructed road, properly crowned and sloped to table-drains, and what appeared to be ample provision for footpaths on either side of the road' (NT 21 September 1901).

By 1906 the road had returned to a bad state of repair as 'the Government has refused point blank to have any more to do with this famous thoroughfare...' (NT, 27 January 1906). There appears to be a period between 1900 and 1906 where the road was maintained as '...it loomed up from a model mud pie to the best road in the district'. The bad state was due to 'wood teams', presumably transporting timber along the roads.



**Figure 5-2 :** Parish map showing location of Bringelly Road, now Grover Crescent. Source: Extract from parish map, County of Cumberland, Parish of Claremont, 28 February 1772.

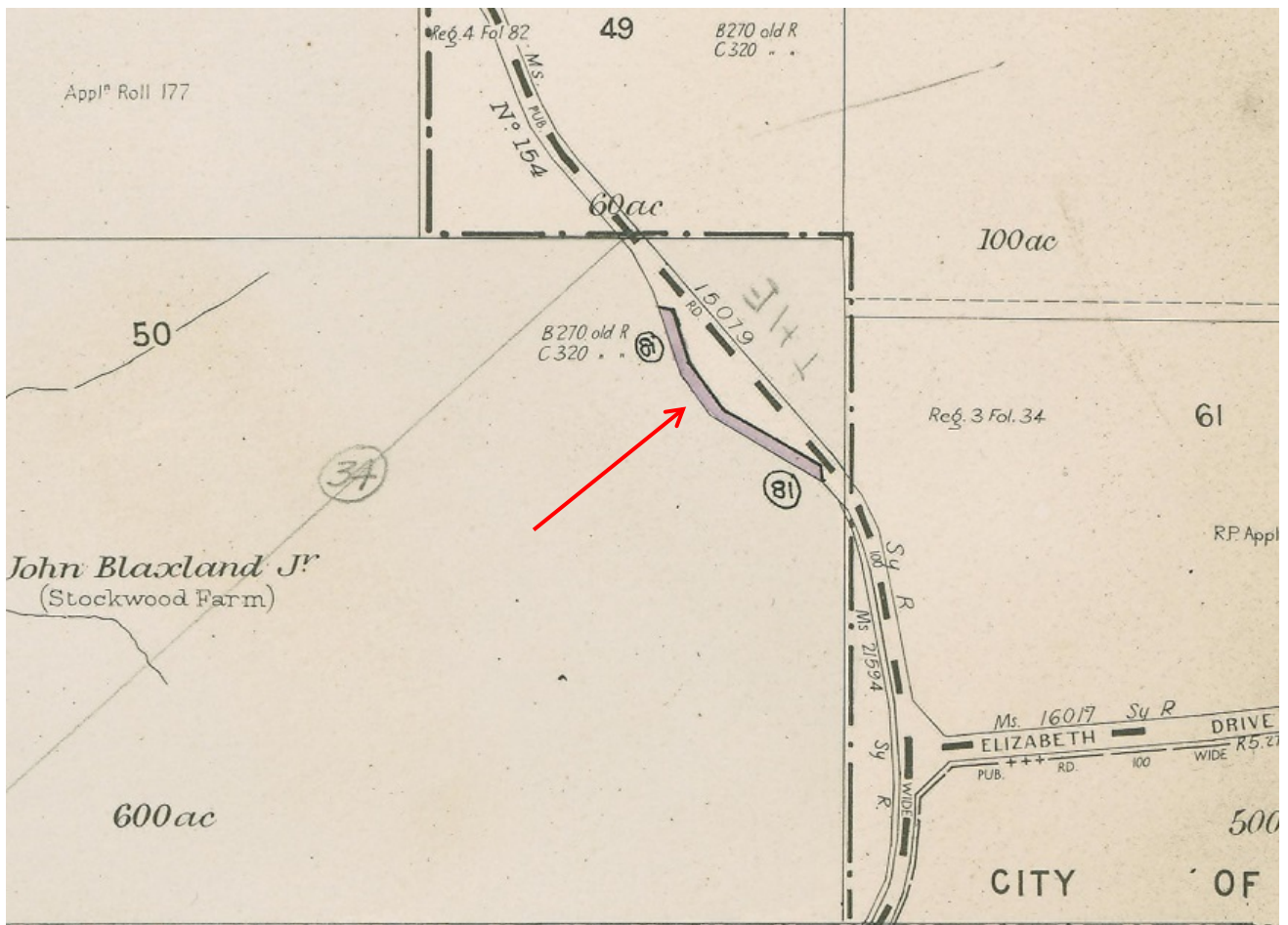


Figure 5-3 : Parish map showing location of old alignment of Bringelly Road. Source: Extract from parish map, County of Cumberland, Parish of Mulgoa, 1971.

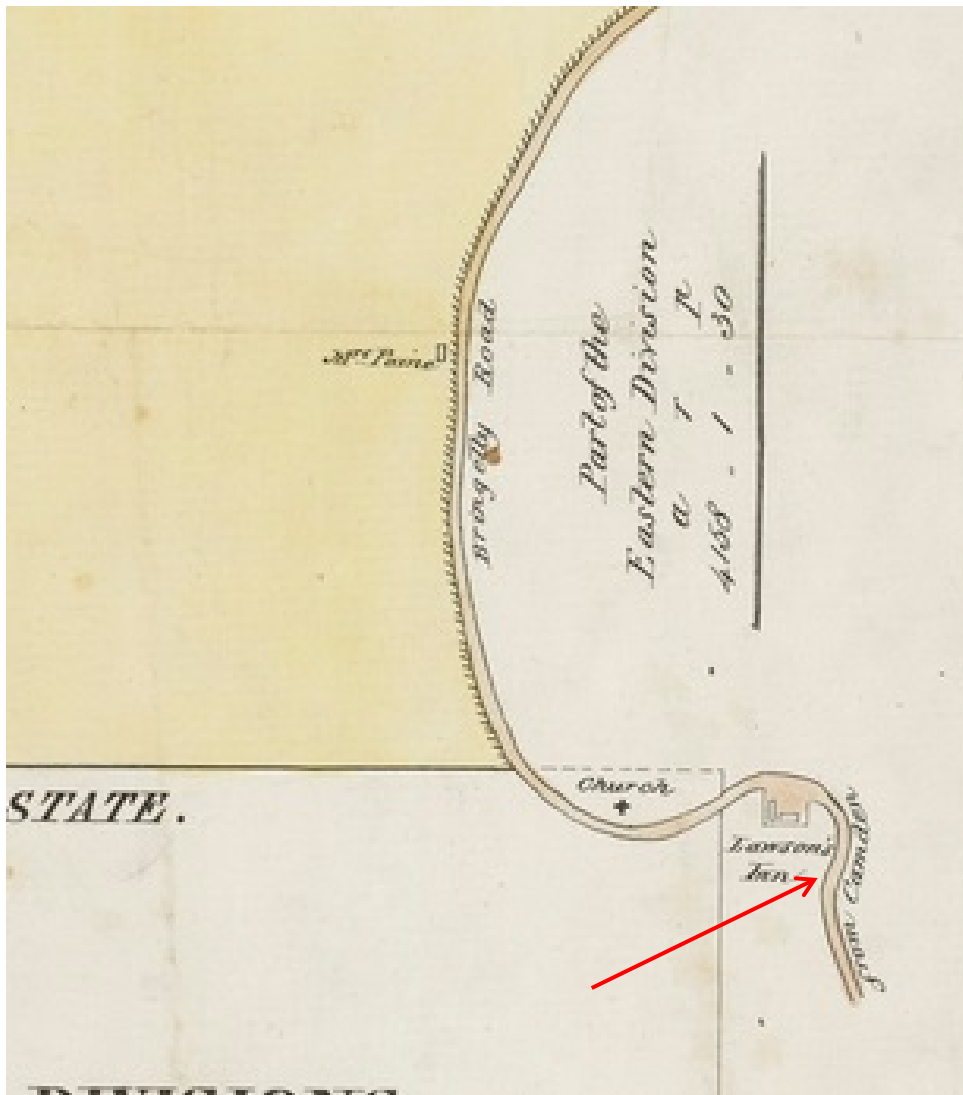


Figure 5-4 : Plan showing location of Bringelly Road, now Eaton Road, in lower right. Source: Plan of the Central and Western Divisions of Luddenham to be sold by public auction by Mt. R.P. Richardson/Samuel Jackson Surveyor, 1864.

### 5.2.2 Curtilage information

The curtilage of Remnants of The Northern Road includes all of Glover Crescent, Eaton Road and the driveway as described above.



### 5.2.3 Significance assessment

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. The original road has been so altered in terms of materials that it no longer demonstrates an important historical pattern.
B – Strong or special associations	Does not meet this criterion. The original road has been so altered that it no longer demonstrates any particular association with the life or works of a particular person or group of persons.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The road is not a major work of an important designer or artist, the original road has lost its original design, and upgrading and clearing of trees have downgraded any prior scenic qualities.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The road is only important to the local community for amenity reasons.
E – Potential to yield information	Does not meet this criterion. As little or no physical evidence of the original road remains due to modifications over time the item has little or no research or archaeological potential.
F – Uncommon or rare	Does not meet this criterion. The road is not the only colonial road example within NSW and there are better examples with some original features and physical evidence.
G – Principal characteristics of a class	Does not meet this criterion. The road is a poor example of early historical NSW roads. Modifications and upgrades have resulted in the loss of a range of characteristics.

### 5.2.4 Statement of significance

A previous assessment (RPS Manidis Roberts 2015: 143) concluded that The Northern Road alignment to the south of the project *is considered to be significant as one of the earliest roads in the area, predating the subdivision of early land grants in the area*. While the three sections of The Northern Road within the construction footprint show the original alignment of The Northern Road (Bringelly Road), the remains have the potential to provide only very limited information due to the modifications and renewal of the road surface over time. The item is considered to have insufficient significance to fulfil the criteria for State or local listing.



**Figure 5-5** : Grover Crescent, Mulgoa, facing north. Photo taken by Jennifer Chandler on 23 February 2016.



**Figure 5-6** : Grover Crescent, Mulgoa, facing south. Photo taken by Jennifer Chandler on 23 February 2016.



**Figure 5-7** : Driveway of 2785-2787 The Northern Road, Luddenham, facing south. Photo taken by Jennifer Chandler on 26 February 2016.



**Figure 5-8** : Eaton Road, facing west. Photo taken by Jennifer Chandler on 25 February 2016.

### 5.3 Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place

The Orchard Hills Cumberland Plain Woodland is listed on the CHL and RNE for its natural heritage values. The assessment of significance, however, also includes reference to historic heritage and Indigenous heritage values. Both the natural heritage values of the site and the historic non-Aboriginal heritage values of the site (ie in relation to the canal) are considered in this assessment.

#### 5.3.1 Description and history

As identified above, the natural heritage values are mainly focused on natural vegetation within the CHP, being retained areas of original native vegetation (including very old relic trees) as well as the natural regrowth of these original plant communities (Godden Mackay Logan (2013). Despite historic disturbance, the CHP is a significant site for the protection of significant natural heritage values.

The natural heritage values identified in the CHL citation was produced in lieu of field verification and, based on various years of site-based monitoring, is reported by Godden Mackay Logan (2013) to overstate the actual on-ground condition of natural heritage values. The natural heritage values of the CHP previously identified by DoEE (2017), Godden Mackay Logan (2013) and within the Biodiversity Assessment Report for this project (Appendix I of the EIS) includes the following:

- The CHP is identified as a core biodiversity area for the conservation of the Cumberland Plain Woodland ecological community. Two categories of Cumberland Plain Woodland were present within the site at the time of the Jacobs (2017) biodiversity surveys. Within this survey area, the patches of Category A Cumberland Plain Woodland (patches that met the core thresholds) were located on the southern portion of the project. Category C patches are poorer condition patches of Cumberland Plain Woodland and Derived Native Grasslands that are contiguous with Category A patches, also located on the southern portion of the project. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity and ecosystem values.
- Part of the least disturbed and largest remaining remnant of Cumberland Plain Woodland, of which 90-95% has previously been cleared (NSW National Parks and Wildlife Service 2002). The larger and more diverse a patch of vegetation is, the greater the likely biodiversity value and its self-sustainability. The patches within the CHP are high quality (up to 96 percent native groundcover, native species richness of up to 47 species in a plot) and their protection within the Defence Estate makes a valuable contribution to the conservation status of this ecological community. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem and existence values.
- This size of the remnant within the CHP is such that it provides a relatively large continuous habitat for species likely to be excluded from small and isolated remnants, such as the Cumberland Plain Woodland bird community. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, existence and scientific values.
- The eastern area of the CHP supports some of the most outstanding examples of mature Forest Red Gum trees remaining in Western Sydney, reaching 50 m high (Godden Mackay Logan 2013). As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, existence and scientific values.
- Some tributaries of Blaxland Creek, which are some of the least disturbed catchments remaining on the Cumberland Plain and on Wianamatta Shale in Western Sydney. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, existence and scientific values.
- The Blaxland Creek tributaries hold regional conservation significance, acting as a refuge for aquatic macroinvertebrate genera that are dependent on low levels of agricultural and urban development. The aquatic macroinvertebrate community in this catchment has a high representation of disturbance-sensitive species (e.g. Stoneflies, Leptophlebiid Mayflies and pollution-sensitive families of Caddisflies). The Blaxland Creek tributaries are richer in aquatic macroinvertebrate genera than most other creeks in Western Sydney. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, existence and scientific values.



- The Blaxland Creek tributaries provide a valuable condition benchmark to measure the degradation of creek systems within Western Sydney. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, geodiversity and scientific values.
- Fire has been excluded from the CHP for approximately 50 years and provides opportunity for ecological research on the regeneration of the CPWSGTF and REFCF ecological communities. This understanding of the natural variation in the absence of fire is important for future identification of the impact of prescribed burning (SKM 2014). A long-term Biodiversity Monitoring program has been running since 2010, designed to investigate the effect of burning of vegetation on flora, fauna and aquatic biota. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem and scientific values.
- Habitat for various EPBC Act threatened species, including Swift Parrot, Regent Honeyeater and Grey-headed Flying-fox. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, existence and scientific values.
- The CHL suggests the presence of habitat for the Bush Stone-curlew (*Burhinus grallarius*) (endangered, TSC Act).
- The Vulnerable *Pultenaea parviflora* was not recorded within the CHP. However a large population (over 1,700 individuals) of *Pultenaea parviflora* is known to occur in some areas of the CHP.

The DEOH management plan (Godden Mackay Logan (2013) ranks the natural heritage values of the site as identified previously in Figure 3-2. The project construction footprint overlaps with the western periphery of the CHP which has been ranked as being of low to moderate significance. The moderate ranking is related to areas of regrowth natural vegetation communities along the western periphery of the CHP within Sectors B and H, as well as a small group of relic native trees within the north-western section of the CHP within Sector B. This area contains two old Eucalyptus tereticornis trees, relics of cleared Shale Plains Woodland Community which pre-dates military occupation of the site, identified as RNT16 within the Heritage Management Plan for the DEOH site (Godden Mackay Logan 2013). The low natural heritage significance ranking is related to grassland.

Aquatic habitat associated with The Blaxland Creek tributaries is ranked as being of moderate to high significance as previously identified in Figure 3-3. The project does not directly overlap with these areas.

An assessment of the impacts of the project to the natural heritage values of the site, including impacts against the Significant Impact Guidelines 1.2 is provided in the Statements of Heritage Impact in **Section 5**.

The CHP site also comprises the Chaffey Brothers Irrigation Scheme Canal (the canal) which has been identified for its non-Aboriginal heritage values. The canal traverses the DEOH, from the Warragamba Dam to Prospect Reservoir pipeline, to an area adjacent to Grover Crescent, Orchard Hills. The canal was inspected as part of the field survey (Survey Area No. 3S-6) for this assessment. This heritage item extends outside the project construction footprint. **Figure 5-10 to Figure 5-13** show the section of canal within the construction footprint, while **Figure 5-14** and **Figure 5-15** are the sections of canal which are outside the construction footprint. No other areas of archaeological potential relating to this heritage item were identified within the area assessed during the field survey.

The dimensions of the canal vary from shallow depressions in the northern section to 3 m wide and 400-500 mm in depth in the southern section. The banks of the canal are eroding and there is vegetation growing throughout the whole length. Two wooden features were noted in the southernmost section of the canal (outside the construction footprint). The first wooden feature comprised wooden beams laid over the canal and resting about 200 mm above the canal base. The beams were about 300 mm wide and 100 mm thick, although some were in poor condition. The second wooden feature was located 10 m northwest of the first. It also comprises wooden beams crossing the canal (**Figure 5-14**). The timber features may have been a covering for the canal, or perhaps used as crossings for the canal. Concrete debris was also present to the immediate west of the second wooden feature and may have been old posts or pylons.

The canal veered north-east from the second wooden feature and split into two canals, about three metres apart. The canals in this location are about 1.5 m wide and vary from a shallow depression down to a depth of 300 mm. The westernmost canal seemed to largely disappear (although it wasn't entirely absent) for the remainder of the length.

The northernmost extent of the canals within the construction footprint was difficult to find in places with only one visible. The canal remnants in this area were extremely shallow from erosion and covered in thick grass (**Figure 5.10** and **Figure 5.11**). In one section the canal extends towards The Northern Road where it was no longer visible due to an informal vehicle track running along the fenceline within the DEOH, as well as in The Northern Road road reserve. The canal re-entered the DEOH further north in a wooded area (**Figure 5.12**). A concrete culvert was noted at the northern end where it disappeared under a vehicle track along the DEOH boundary (**Figure 5.13**). The overall path of the canal matches that shown on a 1972 Claremont parish map (**Figure 5-9**). The canal was not visible on the ground in the small area of land between The Northern Road and Grover Crescent (which was originally The Northern Road).

An irrigation canal is listed on the PLEP as a locally significant archaeological heritage item (A-137). The item is located about one km south-west of the DEOH and the listing does not include the canal in the DEOH which is registered separately on the CHL (105317). The locations for the PLEP listing include Mulgoa Road, Queenshill Drive, Littlefields Road and The Northern Road (Lots 5, 6, 8 and 9, DP 1046980; Lot 181, DP 230752; Lots 5 and 6, DP 718233), but the length of these canal sections are not provided in the listing. The listing includes: 'sites and areas associated with the ambitious Mulgoa Irrigation Scheme developed by noted irrigators the Chaffey brothers and the Cox family. The failed scheme (from c.1889 to 1896) demonstrates marked advance in agricultural production on a scale unique in County Cumberland' (Paul Davies Pty Ltd 2007:21).

Both the DEOH canal and the PLEP registered canal were constructed by the Canadian Chaffey Brothers (George and William) as part of the overall Mulgoa Irrigation Scheme. The brothers had been involved in irrigation schemes in Canada. George Chaffey travelled to Victoria, Australia in 1886 and set up an irrigation settlement at Mildura. Charles Chaffey travelled to South Australia after 1887 to set up an irrigation settlement in Renmark (Westcott 1979). The 1890s brought drought and economic decline for the early settlers and an irrigation scheme was proposed for the Mulgoa area by George Chaffey, Henry Gorman (a property speculator) and Arthur Winbourn Stephen (nephew of George Henry Cox of Winbourne). The irrigation scheme was authorised in 1890, allowing these men to distribute water from the Warragamba River to South Creek in St Marys (Paul Davies Pty Ltd 2007:154). However, in 1893 the Irrigation Scheme stalled as the Chaffey brothers became bankrupt by the 1890s economic depression. At the time the scheme failed construction of the main channel (within the DEOH land) and the pumping station (outside the DEOH) had been underway but works on the Mulgoa Irrigation Scheme were never completed (Godden Mackay Logan 2013:20).

The CHL listing for Orchard Hills Cumberland Plain Woodland states the following about the canal:

No detailed inspection of the No 1 Central Ammunition Depot has been made for historic national estate values. Orchard Hills appears to retain little evidence of nineteenth century use with the exception of remnant fence lines, the footings of some housing and evidence of the Chaffey Brothers irrigation scheme. The latter can be seen in the south-west corner of the site where the main canal contours across the hillside below Northern (Bringelly) Road on Parish Portions 9 and 17 in the Parish of Claremont. The course of the 50 inch canal can be clearly seen on air photos of the area. Although unexamined, the tunnels under Bringelly Road may also be intact.

The Orchard Hills Defence site is associated with the Mulgoa Irrigation Scheme established in 1890 by the Chaffey Brothers. At Orchard Hills there are remnants of the irrigation canal, and possible remains of the tunnel under Bringelly (now Northern) Road. The scheme was designed to pump water from the Nepean River and potentially irrigate extensive areas of land towards St Mary's. Stopped by the financial depression of the 1890s the remnants of the distribution canal are evidence of the importance of this area, and of the expansion of irrigation, in the late nineteenth century in NSW (Australian Historic Themes: 3.11 Altering the environment). It is possible that other historic national estate values may exist on this defence site. As yet these values have not been identified or assessed (Commonwealth Department of the Environment and Energy 2002).

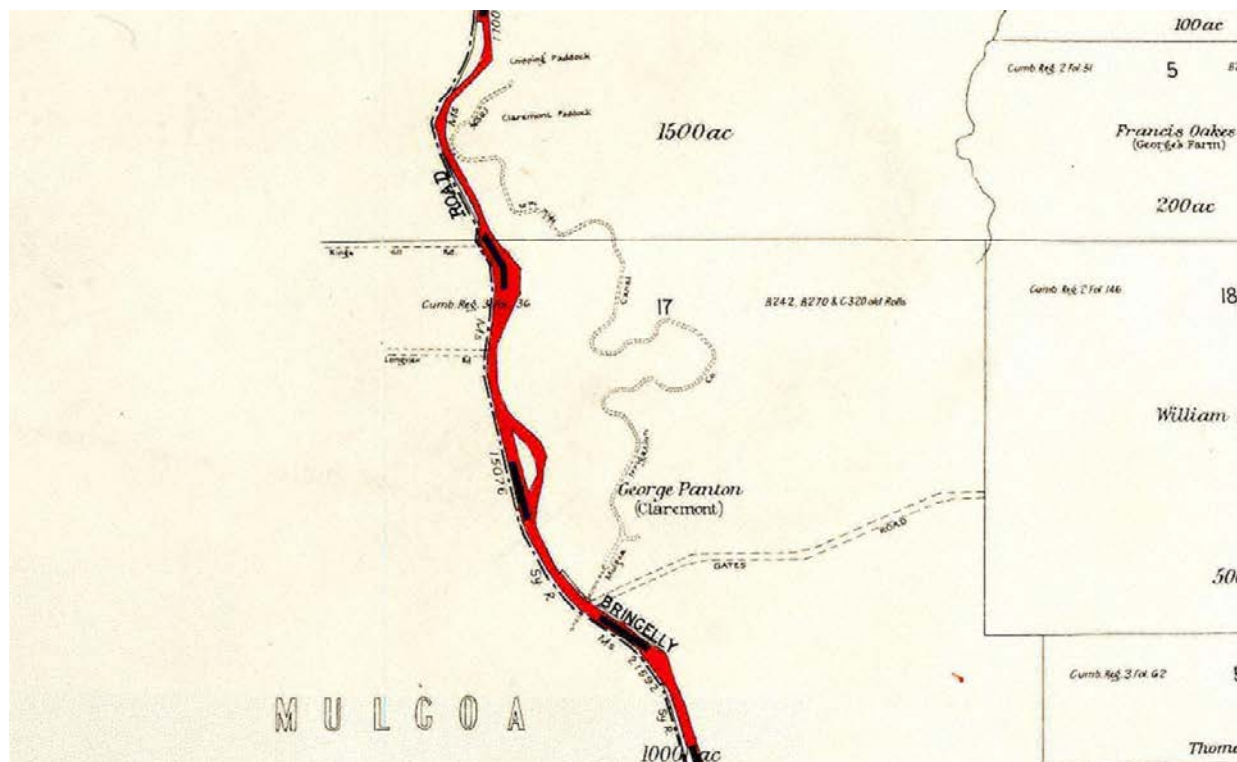


Figure 5-9 : 1972 Claremont parish map showing the canal which is labelled as Mulgoa Irrigation Co. Canal

### 5.3.2 Curtilage information

The curtilage of the Orchard Hills Cumberland Plain Woodland CHP site is shown in **Figure 7-1**. The curtilage of the Chaffey Brothers Irrigation Scheme Canal defined is shown on **Figure 7-2**.

### 5.3.3 Significance assessment

The significance assessments against the CHL significance criteria for cultural heritage values are provided in this Section. The following significance assessment is taken directly from the CHL listing (Commonwealth Department of the Environment and Energy 2002) and the Heritage Management Plan (Godden Mackay Logan 2013), with updates to the heritage values assessment by the current author noted in *italics*.

CHL/SHR Criterion	Assessment
CHL A – Importance in the course, or pattern, of Australia's natural or cultural history	Orchard Hills has surviving evidence of canal earthworks from the 1890 Chaffey Brothers irrigation scheme at Mulgoa. The promoters of the scheme planned to pump water from the Nepean River to Mulgoa where a 4,000,000 gallon reservoir was constructed. The surviving earthworks are part of the 12 mile contour canal designed to run from Mulgoa as far as St Mary's. The canal runs through tunnels under the Northern Road (Bringelly Road) towards St Mary's through the site at Orchard Hills. Although the scheme was almost completed the Depression of 1893 resulted in its demise (Fox & Associates 1991: 41).
A - Importance in the course, or pattern, of Australia's natural or cultural history	The Mulgoa Irrigation Scheme is important in the course and pattern of New South Wales and the Mulgoa/Orchard Hills districts because of its place as an attempt to irrigate pastoral lands and allow farming of areas which were otherwise unsuitable for agriculture. The scheme contains important engineering elements that provide an understanding of hydrological systems, including movement of water upslope to a reservoir and distribution through a planned distribution network.



CHL/SHR Criterion	Assessment
	<p>The Mulgoa Irrigation Scheme was comparable with two other irrigation schemes, implemented in Victoria and South Australia, which resulted in the establishment of Mildura and Renmark respectively. As such, the Mulgoa Irrigation Scheme provides evidence for one of the New South Wales government's economic aims in Western Sydney, prior to Federation.</p> <p>The ultimate failure and abandonment of the Mulgoa Irrigation Scheme in 1895 provides evidence of the financial difficulties encountered by the Mulgoa Irrigation Company in New South Wales, along with their comparable sister companies in Victoria and South Australia; as well as the general economic situation in New South Wales, where the government was unwilling to fund and complete the scheme following the withdrawal of the Mulgoa Irrigation Company (Godden Mackay Logan 2013:91-92).</p> <p>The RAAF land at Orchard Hills is the least disturbed and largest remaining remnant of Cumberland Plain Woodlands (NSW NPWS 1997, NSW NPWS 2000, Penrith Council 1997). The size of the East Orchard Hills remnant provides a comparatively large area of continuous habitat for species likely to be excluded from remnants that are small and isolated, particularly the Cumberland Plain woodland bird assemblage. (NSW NPWS 1997).</p> <p>The tributaries of Blaxland Creek at Orchard Hills are among the least disturbed catchments remaining on the Cumberland Plain and are regarded as possibly the most pristine creek system on Wianamatta Shale left in western Sydney (NSW Natural Environment Evaluation Panel 2000, Chessman 1999, NSW NPWS 1997). The macro-invertebrate community of this catchment has a high representation of disturbance-sensitive taxa. Stoneflies, Leptophlebiid mayflies and pollution-sensitive families of caddisflies appear to be confined to such streams within the Cumberland Plain (Chessman 1999). Orchard Hills acts as a refuge and reservoir for disturbance-sensitive aquatic macro-invertebrates (NSW NPWS 1997).</p> <p>The Blaxland Creek supports a higher level of macro-invertebrate diversity at the genera level than most other creeks in western Sydney (Chessman 1999).</p>
<p>B – Uncommon, rare or endangered aspects of Australia's natural or cultural history</p> <p>F – Uncommon, rare or endangered aspects of NSW cultural or natural history</p>	<p><i>The Penrith Heritage study (Paul Davies Pty Ltd 2007) noted that the LEP-listed section of the Chaffey Brothers irrigation scheme (situated outside the CHL boundary) met the requirements of this criterion, but no further detail of that assessment was available for the current assessment. As the canal situated in the construction footprint is part of the same overall irrigation scheme, it also meets this criterion.</i></p> <p>Orchard Hills is almost entirely vegetated with remnants and regenerating areas of Cumberland Plain Woodland and Sydney Coastal River Flat Forest (NSW NPWS 2000). Cumberland Plain Woodland is regarded as an endangered ecological community at both state and Commonwealth level. Sydney Coastal River Flat Forest is regarded as an endangered ecological community at state level that is poorly represented in reserves. Orchard Hills is regarded as a core biodiversity area for conservation of Grey Box Woodland (Cumberland Plain Woodland) and River Flat Forest (NSW NPWS 1997) and an outlier of the Castlereagh Ironbark Forest community.</p> <p>The bush thickknee (<i>Burhinus grallarius</i>), which is listed as endangered in NSW and has been recorded from Orchard Hills is regarded as a species of the greatest conservation concern in the Cumberland region (NSW NPWS 1997).</p> <p>Orchard Hills has one plant listed as vulnerable in NSW, prickly spider-flower (<i>Grevillea juniperina</i>). Six other plant species are found in the place which are regarded as being of regional conservation significance (NSW</p>

CHL/SHR Criterion	Assessment
	<p>NPWS 1997). These are spreading bush-pea (<i>Pultenaea microphylla</i>), fuzzweed (<i>Vittadinia pustulata</i>), water-milfoil (<i>Myriophyllum simulans</i>), dwarf skull-cap (<i>Scutellaria humilis</i>), early nancy (<i>Wurmbea biglandulosa</i>) and the grass (<i>Panicum obseptum</i>). An additional 32 plant species are found at Orchard Hills which are regarded as inadequately conserved in western Sydney (NSW NPWS 1997).</p> <p>The tributaries of Blaxland Creek are regarded as having regional conservation significance for invertebrate species dependant on low levels of agricultural and urban development (NSW NPWS 1997).</p>
<p>C – Potential to yield information that will contribute to an understanding of Australia's natural or cultural history</p> <p>E - Potential to yield information that will contribute to an understanding of NSW cultural or natural history</p>	<p>Further study of the Mulgoa Irrigation Scheme could yield new information on the planned subdivision and establishment of the township of Mulgoa. Investigation of the remains of the Mulgoa Irrigation Scheme could provide further insight into the mode of canal construction, landscape modification and technology for a gravity-fed water canal (Godden Mackay Logan 2013:93).</p> <p><i>The Chaffey Brothers Irrigation Scheme Canal has the potential to yield information about early canal/irrigation practices and construction, such as the wooden features located in the southern section.</i></p> <p>The tributaries of Blaxland Creek at Orchard Hills are some of the least disturbed creeks remaining on the Cumberland Plain (NSW Natural Environment Evaluation Panel 2000, Chessman 1999, NSW NPWS 1997). The creek and its tributaries provide a valuable benchmark to measure the degradation of creek systems generally in western Sydney (NSW NPWS 1997).</p> <p>Fire has been excluded from Orchard Hills for approximately 50 years, and the place provides an opportunity for ecological research on regenerating Cumberland Plain Woodland in the absence of fire (NSW Natural Environment Evaluation Panel 2000).</p>
<p>D –Principal characteristics of:</p> <ol style="list-style-type: none"> <li>1. A class of Australia's natural or cultural places; or</li> <li>2. A class of Australia's natural or cultural environments</li> </ol> <p>G - Important in demonstrating the principal characteristics of a class of NSW cultural or natural places or cultural or natural environments.</p>	<p>The remnant archaeological remains for the Mulgoa Irrigation Scheme are located within, and are a component of, a rural cultural landscape. The Mulgoa Irrigation Scheme represents an attempt to modify the rural landscape to allow more intensive agricultural purposes, in a similar manner to that undertaken in Mildura and Renmark. The cultural landscape is characterised by undulating low hills; a natural landscape suitable for development of a gravity-fed irrigation canal (Godden Mackay Logan 2013:94).</p> <p>The place comprises the largest and least disturbed remnant of two vegetation units of the Cumberland Plain Woodland as well as some of the most undisturbed areas of Sydney River Flat Forest in the Penrith area (NSW NPWS 1997, 2000). At East Orchard Hills, mature tree heights reach 50 m and include some of the most outstanding examples of Forest Red gum trees remaining in western Sydney (NSW NPWS 1997).</p> <p>Several Indigenous sites were noted during the one day inspection on 17 April 2000. Many more sites are likely along the main stream especially at the third order tributary junctions (pers comm. Peter Mitchell, 2000).</p>
<p>E – Particular aesthetic characteristics valued by a community or cultural group</p> <p>C - Important in demonstrating aesthetic characteristics and/or</p>	<p>No values provided for this criterion in the CHL listing.</p>

CHL/SHR Criterion	Assessment
a high degree of creative or technical achievement in NSW	
F – High degree of creative or technical achievement at a particular period C - Important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW	The Mulgoa Irrigation Scheme demonstrates a high degree of technical achievement, where water needed to be raised from the Nepean River (through a pumping station and a series of pipes) to be held in a reservoir (Square Dam). From this storage point the Mulgoa Irrigation Scheme was to move and distribute water through the landscape by a gravity fed system of canals with a low gradient. The canal distribution network demonstrates considerable technical understanding of topography, planning and hydrological engineering (comparable to that undertaken for the contemporary Upper Nepean Scheme) (Godden Mackay Logan 2013:95).
G – Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons D - Strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons	No values provided for this criterion in the CHL listing or DEOH HMP.
H - Special association with the life or works of a person, group of persons of importance in Australia's natural or cultural history B - Strong or special association with the life or works of a person, or group or persons, of importance in NSW cultural or natural history	The Mulgoa Irrigation Scheme was conceptualised and implemented by George and William Chaffey in 1890. In the 1880s the Chaffey brothers came to Australia on the invitation of Alfred Deakin (a Victorian Cabinet Minister), and establishment of the towns of Mildura (Victoria) and Renmark (South Australia) around comparable irrigations schemes took place. The Chaffey brothers' initial success in Victoria and South Australia led to an invitation to develop a similar scheme in New South Wales – the Mulgoa Irrigation Scheme. Following an initial period of construction, when parts of the Mulgoa Irrigation Scheme infrastructure was built, the scheme failed as a consequence of the economic situation in New South Wales and Victoria/South Australia, combined with the Chaffey brothers' personal monetary difficulties. The residual evidence of the Mulgoa Irrigation Scheme provides a direct connection to the Chaffey brothers, who visualised and engineered it (Godden Mackay Logan 2013:96)
I - Importance as part of Indigenous tradition	No values provided for this criterion in the CHL listing.

#### 5.3.4 Statement of significance

The current statement of significance from the HMP (Godden Mackay Logan 2013:97-98) is as follows:

Defence Establishment Orchard Hills (DEOH) is vegetated with remnants and regenerating areas of Cumberland Plain Woodland, Castlereagh Ironbark Forest and Sydney Coastal River Flat Forest. Cumberland Plain Woodland is listed as a critically endangered ecological community at both state (*Cumberland Plain Woodland in the Sydney Basin Bioregion*) and Commonwealth levels (*Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*). At state level, Sydney Coastal River Flat Forest (*River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*) and Castlereagh Ironbark Forest (*Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion*) are regarded as endangered ecological communities that are under-represented in reserves. DEOH is regarded as a core biodiversity area for conservation of both these communities.



The place comprises the least disturbed and largest remaining remnant of Cumberland Plain Woodland. The size of the DEOH remnant provides a comparatively large area of continuous habitat for species likely to be excluded from small and isolated remnants, particularly the Cumberland Plain Woodland bird community. Mature tree heights at Orchard Hills reach 50m and include some of the most outstanding examples of Forest Red gum trees remaining in Western Sydney.

The tributaries of Blaxland Creek at Orchard Hills are among the least disturbed catchments remaining on the Cumberland Plain and Wianamatta Shale in Western Sydney. Blaxland Creek tributaries are richer in aquatic macro-invertebrate genera than most other creeks in Western Sydney. The macro-invertebrate community of this catchment has a high representation of disturbance-sensitive species. Stoneflies, *Leptophlebiid* mayflies and pollution-sensitive families of caddisflies appear to be confined to such streams within the Cumberland Plain. The DEOH therefore acts as a refuge and reservoir of regional conservation significance for such species that are dependent on low levels of agricultural and urban development.

The bush thickknee (*Burhinus grallarius*) a rare bird, is listed as endangered in New South Wales and is regarded as a species of the greatest conservation concern in the Cumberland region. It has been recorded at Orchard Hills. The DEOH has one plant listed as vulnerable at Commonwealth level (*Pultenaea parviflora*), and two plants listed as vulnerable in New South Wales, the prickly spider-flower (*Grevillea juniperina*) and *Dillwynia tenuifolia*. Individuals from the Endangered Population of *Marsdenia viridiflora* subsp. *viridiflora* are found across DEOH. Six other plant species are found in the area, which are regarded as being of regional conservation significance. These are spreading bush-pea (*Puttenaea microphylla*), fuzzweed (*Vittadinia pustulata*) water-milfoil (*Myriophyllum simulans*), dwarf skull-cap (*Scutellaria humilis*), early nancy (*Wurmbea biglandulosa*) and the grass *Panicum obseptum*. An additional 32 plant species are found at Orchard Hills which are regarded as inadequately conserved in Western Sydney.

The low level of disturbance in the tributaries of Blaxland Creek within Orchard Hills provide a valuable benchmark to measure the degradation of creek systems generally in Western Sydney. The absence of fire at Orchard hills for approximately 50 years to 2001 provides an opportunity for ecological research on regenerating Cumberland Plain Woodland.

The DEOH is a component of the Darug Aboriginal people's cultural landscape, where the place contains a representative number of stone artefact sites, situated within intact landforms and soil deposits. Aboriginal sites identified thus far within DEOH represent a low percentage of those which could be present, but provide direct evidence for Darug Holocene occupation and economy in the context of Western Sydney. The DEOH has the potential to contain large numbers of representative archaeological sites which have not been significantly impacted by historical development.

The range of archaeological evidence within the DEOH is important to the Darug people because it provides physical evidence for their land occupation, Aboriginal traditions and the connection to a larger tribal area. Further study of the archaeological resources within the DEOH could provide new evidence for spatial patterning of archaeological deposits, evidence for trade and exchange networks and possibly social regulations in terms of spatial occupation of the landscape.

The Mulgoa Irrigation Scheme was privately funded and engineered by the Mulgoa Irrigation Company; a company owned by the Chaffey brothers who were directly responsible for the establishment of the towns of Mildura (Victoria) and Renmark (South Australia) around comparable irrigation schemes in the 1880s and 1890s. The archaeological remains of the Mulgoa Irrigation Scheme canal, contained within its original as-built landscape context, are integral elements of the scheme, which was intended to transform economic and social aspects of Mulgoa (and Orchard Hills) in the 1890s. Following an initial period of construction, when sections of the Mulgoa Irrigation Scheme infrastructure were built, the scheme failed as a consequence of the economic situation in New South Wales and Victoria/South Australia, combined with the Chaffey brothers' personal monetary difficulties. The resultant physical evidence of the Mulgoa Irrigation Scheme, primarily as archaeological remains within a rural landscape, provides direct evidence to support the history of the Mulgoa Irrigation Scheme, the engineering requirements of the gravity-fed water irrigation scheme, the commencement of construction and ultimately its failure.

The physical evidence and landscape setting of the scheme, within a modified rural landscape, are vital for understanding the extent of the Mulgoa Irrigation Scheme and how it would have operated. The residual

evidence provides a direct connection to the Chaffey brother, who visualised and engineered it. An assessment of the local area has shown that most of the remnant archaeological and landscape evidence for the Mulgoa Irrigation Scheme is to be found within the boundary of the DEOH.



**Figure 5.10** : Section of canal within south part of construction footprint, facing south. Photo taken by Jennifer Chandler on 6 April 2016.



**Figure 5.11** : Section of canal within south part of construction footprint, facing east. Photo taken by Jennifer Chandler on 6 April 2016.



**Figure 5-12** : Canal at northern end, facing north-east. Photo taken by Jennifer Chandler on 6 April 2016.



**Figure 5-13** : Culvert, northern end of canal, facing north-west. Photo taken by Jennifer Chandler on 6 April 2016.





**Figure 5-14** : Wooden feature 2 at the southern section of the canal, facing west. Photo taken by Jennifer Chandler on 6 April 2016.



**Figure 5-15** : Canal at southern section, facing north. Photo taken by Jennifer Chandler on 6 April 2016.

### 5.3.5 Tolerance for change

A ranking of 'tolerance for change' has been applied across the DEOH site to identify the extent to which a place's heritage values/significance and key attributes are able to tolerate change without having an adverse impact on the nature or degree of its heritage values or the significance of the site overall (Godden Mackay Logan 2013).

As identified above, the key attributes of natural heritage elements on DEOH are the floristics and structure of the ecological communities, and the existence of isolated relic trees (Godden Mackay Logan 2013). These natural heritage elements have different tolerance for change as follows:

- Remnant vegetation communities have some tolerance for change
- Relic native trees have a low tolerance for change
- Regrowth natural vegetation communities have a reasonable tolerance for change
- Aquatic habitats have a low tolerance for change

There are no areas of remnant vegetation communities located within the project construction footprint where it overlaps with the CHP. The project construction footprint overlaps with some areas identified as regrowth natural vegetation communities along the western periphery of the CHP within sectors B and H of the DEOH. These areas would be able to tolerate a reasonable change, being that the sector or element and its key attributes have relatively little heritage value, but may contribute to the overall significance of the site. In general, the element can be altered to a reasonable degree provided it does not impact the heritage values of the DEOH.

The construction footprint also overlaps with one area of relic native trees located within the northern section of the CHP within Sector B of the DEOH. This area has a low tolerance for change meaning the sector/element and its key attributes embody the heritage values, retaining a high degree of intactness with no major change or alterations, or only minor alterations that do not detract from the heritage values. In general, the element should be retained and conserved.

Aquatic habitats mapped within the DEOH have a low tolerance for change; however the project does not overlap with these areas directly and is not expected to indirectly impact them (refer to **Section 7**).

In relation to historic heritage values potentially impacted by the project, the canal and the area in which is situated (Sector H) has a low tolerance for change in relation to new development and demolition/remediation.



## 5.4 Item 3: Warragamba Dam to Prospect Reservoir pipeline

### 5.4.1 Description and history

The Warragamba Dam to Prospect Reservoir pipeline currently dissects the construction footprint immediately south of the DEOH (**Figure 5-16, Figure 5-17**) on Lot A DP341629 and Lot A DP341893. It was surveyed on 23 February 2016 (Survey Area No. 3S-5). No areas of archaeological potential were identified during the field survey of this heritage item. The pipeline and associated items are located above the ground surface and clearly visible. There is unlikely to be any associated archaeological deposits relating to the pipeline. The large steel pipeline is on an east/west alignment and located underground at The Northern Road. It emerges about 100 m from The Northern Road on either side.

A second survey was undertaken for additional study areas on 20 September 2016 (Survey Area No. 4-26 and 4-27) and two concrete culverts relating to the pipeline were recorded.

- Survey Area No. 4-26: a concrete culvert covers a drainage channel. The culvert appears to have been built to allow access to four concrete building foundations (located approximately 14 m west of the project). The nearby building foundations are reported to have been a construction depot for the pipeline construction upgrade in the 1950s (pers. comm., Water NSW staff, 20 September 2016). The culvert was therefore likely to have been constructed in the 1950s (**Figure 5-18**)
- Survey Area No. 4-27: a concrete block culvert is likely to be associated with the 1940s construction of the pipeline due to its location adjacent to the 1940s constructed pipeline (**Figure 5-19**).

The Warragamba Dam was constructed to supply water to Sydney. The dam was completed in 1960 and supplies water to the Prospect Reservoir via large-diameter steel pipelines between the two locations. The pipeline was originally laid in 1940 as part of an emergency scheme, with an upgrade of the pipeline undertaken in the 1950s. The Warragamba Water Scheme was part of a large scale plan over a century to establish a water supply to Sydney (Paul Davies Pty Ltd 2007:74). The Penrith Heritage Study (Paul Davies Pty Ltd 2007:206) noted that the pipeline demonstrates steel fabricating technology of the day, but concluded that the pipeline had no particular significance to the history of Penrith.

Construction of the pipeline began in 1940 and involved a substantial number of workers, not all of whom were Australian. Strikes were held by workers during the construction and there were government inquiries into the use of foreign workers. As a result of World War II, large numbers of Chinese immigrants entered Australia due to Japan's involvement with China and in the Pacific. Some of these Chinese men were ship crew members who refused to go back to Japanese held areas on their ships (Williams 1999:7). After the bombing of Pearl Harbour there were hundreds of Chinese seamen stranded at Australian ports. In 1942 the Chinese Seamen's Union was formed by the Chinese Youth League. The Union was associated with the Seamen's Union of Australia (Ward 2015).

It was reported that the Federal Government had made an agreement with the Chinese Government to find work for the stranded Chinese seamen. The work was to be either on ships or land, was subject to conditions determined by the Minister for Shipping (Mr Beasley) and would be temporary, with the men being repatriated afterwards. It was an offence for either employers or Chinese workers to engage in employment outside of these conditions (*The Advertiser*, 18 December 1943).

The *Evening Advocate* (5 May 1942) reported that a Chinese labour corps was recruited by the Sydney Metropolitan Water Board to begin work on the Warragamba Dam to Prospect Reservoir pipeline. Workers were to be paid Australian award rates and live in a community camp. The use of Chinese workers by the Sydney Metropolitan Water Board was to be investigated by the Commonwealth Department of Labour and National Services in Canberra. If the investigation proved that the Water Board were using Chinese workers, work on the pipelines would be suspended pending a full inquiry by the Commonwealth Government. The man responsible for the investigation was Mr Ward, the Minister for Labour.

Some politicians expressed their concern at how the Government inquiry might be seen by 'our Chinese Allies' with Senator Poll (United Australia Party, Queensland) asking the Government to 'consider Mr Ward's impulsive

action' in the Senate on 2 May 1942. A meeting was held between Mr M L Tuan, staff at the Chinese Legation, and Mr Ward. The meeting was reported as being 'most friendly' (*The West Australian*, 2 May 1942).

There were many delays and stoppages during the construction of the pipeline. On 3 June 1943 the *Northern Star* reported that 180 Chinese workers from the Warragamba Dam to Prospect Reservoir pipeline had been taken off the job by the Manpower Department as they were required for 'urgent war work'. The Chinese workers therefore, only worked on the pipeline for a year. The Water Board experts believed there may be a water shortage in Sydney if the second pipeline was not completed by 1945 (*Sydney Morning Herald* (SMH), 19 August 1944). Steel for the pipeline construction had been supplied to contractors but that they could not fabricate the pipes until labour was made available. The workers had been transferred to work on another project and work on the pipeline was suspended. Workmen on the pipeline had been on strike for almost a week when work resumed. A conference between the disputes committee of the Trades and Labour Council and engineering officers of the Water Board resulted in 450 men returning to work (SMH, 2 September 1947).

The Chinese workers on the Warragamba Dam to Prospect Reservoir pipeline included carpenters, fitters and stewards (*Newcastle Morning Herald and Miners' Advocate* (NMHMA), 5 May 1942). The 200 Chinese workers were housed in a camp on Mulgoa Road (SMH, 5 May 1942). The Chinese labourers would camp separately to the other men 'because of special feeding conditions' (*Daily Advertiser*, 30 April 1942). They were also members of the Water Board Union and were told they would receive full pay rates (*Queensland Times*, 4 May 1942). Pipeline workers reportedly lived in open tents, with both theft and health (including pneumonia) being a problem (*Nepean Times* (NT), 7 July 1949, 29 July 1943). The death of a pipeline labourer was also reported. The man, aged 40, was found deceased 'in his tent on the Warragamba Dam to prospect Reservoir pipeline site, six miles from Penrith'. The man had a fractured skull and was known to police from several violent crimes (NMHMA, 11 May 1948). An advertisement for labourers in the SMH (1 December 1945) stated that 'workers must have their own blankets and prepare their own meals. Camping facilities are provided, an adequate camping allowance is paid and transport to and from Rooty Hill railway station provided on Monday morning and Friday night'.

Workers stayed in tents in camps close to the pipeline with two being near the current construction footprint. No. 6 Camp was located on Luddenham Road, about three miles from Luddenham. There was a private pipeline road that ran from the camp to Mulgoa (NT, 22 October 1942). No. 5 Camp was located on Bringelly Road (NT, 4 November 1948).

#### 5.4.2 Curtilage information

The curtilage of the Warragamba Dam to Prospect Reservoir pipeline is shown in **Figure 7-3**.

#### 5.4.3 Significance assessment

There has been no previous significance assessment undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	The pipeline is associated with a significant historical trend – use of foreign labour while Australians were absent due to World War II. It also demonstrates the government response to Chinese men abandoning their ships due to Japanese occupation of China. Around 200 Chinese worked on the pipeline and lived in a camp for at least a year.
B – Strong or special associations	Does not meet this criterion. The pipeline is not associated with any particular individual or group of particular importance to NSW's history.

NSW Criterion	Assessment
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The pipeline is not a major work by an important designer or artist and does not demonstrate any particular degree of technical achievement as it used standard technology of the period.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The pipeline is only important to the local community for amenity reasons.
E – Potential to yield information	The pipeline demonstrates steel fabrication technology during the 1940s-1950s. While the two concrete culverts are associated with the construction of the pipeline over its history, they do not contribute to the historical significance of the site, nor demonstrate the technological significance of the pipeline.  As the pipeline and associated items are intact structures situated above the ground surface and clearly visible there is unlikely to be any associated archaeological deposits relating to the pipeline.
F – Uncommon or rare	Does not meet this criterion. The pipeline does not possess uncommon, rare or endangered aspects of NSW's cultural or natural history.
G – Principal characteristics of a class	Does not meet this criterion. While the pipeline has the key characteristics of a utilities pipeline in terms of its structure, it does not demonstrate particularly important construction techniques, changing use of technology, or use of materials.

#### 5.4.4 Statement of significance

The pipeline is associated with an important historical trend relating to the use of foreign labour in Australia during World War II. The pipeline also has the potential to yield information about steel pipe construction techniques employed at the time. The item is therefore considered to have sufficient significance to fulfil the criteria for local listing.



**Figure 5-16** : Pipeline, facing east. Photo taken from gate on The Northern Road by Jennifer Chandler on 23 February 2016.



**Figure 5-17** : Pipeline, facing west. Photo taken from gate on The Northern Road by Jennifer Chandler on 23 February, 2016.





**Figure 5-18** : The concrete culvert in Survey Area No. 4-26. Photo taken by Andrew Roberts on 20/09/16.



**Figure 5-19** : The concrete culvert in Survey Area No. 4-27. Photo taken by Andrew Roberts on 20/09/16.

## 5.5 Item 4: Fruit Orchard, Luddenham

### 5.5.1 Description and history

The property Lot 23 DP207317 at 2580 The Northern Road, Luddenham was surveyed (Survey Area No. 3S--8) and a small fruit orchard identified. The orchard contains less than 20 fruit trees (possibly apple and/or pear). The age of the trees is unknown (**Figure 5-20, Figure 5-21**). No areas of archaeological potential were identified during the field survey of this heritage item. The item was assessed to not be a heritage item and there is no potential for archaeological deposits to be present.

This property was originally part of a 1000 acre land grant called Claremont. The land was granted to George Panton on 31 August 1819 (Paul Davies Pty Ltd 2007:151).

A title search for this property was unsuccessful due to the address not being recognised. However, a title search is unlikely to yield information about the establishment of an orchard of this size on this particular property. While orchards were important in the area this orchard is a small size and the age of the trees is unable to be established, therefore it is unlikely to be significant.

### 5.5.2 Curtilage information

The curtilage for the Fruit Orchard includes the remnant trees with a buffer of about 1 m, and is shown in **Figure 5-1**.

### 5.5.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. The orchard does not demonstrate any particularly important role in NSW's history.
B – Strong or special associations	Does not meet this criterion. The orchard is not associated with any particular person or group of historical importance.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The orchard does not have visual or sensory appeal, or landmark or scenic qualities.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The orchard has no strong or special associations with any identified community or cultural groups.
E – Potential to yield information	Does not meet this criterion. The orchard has no archaeological or research potential.
F – Uncommon or rare	Does not meet this criterion. The orchard is not uncommon or rare in this region. The orchard does not possess uncommon or endangered aspects of NSW's cultural history. Orchards are common in the area and this particular one was considered to have no heritage value.
G – Principal characteristics of a class	Does not meet this criterion. The orchard is a poor example of its type.

#### 5.5.4 Statement of significance

While the site is associated with the important historical industry of orcharding, the size of the orchard, the limited information about the history of the property and indeterminate age of the trees provide very little information about the industry. The site is therefore not considered to be significant.



**Figure 5-20** : Orchard, facing east. Photo taken by Jennifer Chandler on 23 February 2016.



**Figure 5-21** : Orchard, facing south. Photo taken by Jennifer Chandler on 23 February 2016.



## 5.6 Item 5: Weatherboard House, Slab Hut and Old Dairy, Luddenham

### 5.6.1 Description and history

The property Lot 502 DP580982 at 2787 The Northern Road, Luddenham was surveyed (Survey Area No. 4-2) on 24 February 2016.

This site comprised a late 19<sup>th</sup> to early 20<sup>th</sup> century weatherboard house with a wide, open verandah on three sides (**Figure 5-22, Figure 5-23**). There was a more recent extension at the rear of house, two brick chimneys on opposite sides of the house. The original verandah flooring had been replaced. The house has a gabled corrugated iron roof. Several trees in the garden are almost 50 years old. There was a wooden slab hut located at the back of the property (**Figure 5-24, Figure 5-25, Figure 5-26**). A concrete slab and a single wooden post remains from what the property owner identified as the coolroom/dairy (**Figure 5-27**). There was no evidence of ruins, bottle dumps, grass-covered mounds that would indicate any areas of archaeological potential. The potential for archaeological deposits is considered to be unlikely.

This property was originally part of a land grant to John Blaxland called Stockwood Farm. The land was 600 acres in size and granted on 31 August 1819. A full title search for this property was unsuccessful due an old system number preventing further tracking of the land title.

The following information was obtained from the current property owner (Malcolm Turner, pers. comm, 24 February 2016). The original property owners were the Bouffier family.<sup>4</sup> The weatherboard house was constructed in the late 19<sup>th</sup> century. The property was then owned by the Orton family. There was another building to the north-west of the existing house which has been demolished. Either this building or the slab hut out the back was used by the Orton family for a kitchen. The property with the weatherboard house was bought from a consortium who subdivided the block. The farm used to operate as a dairy which included a cool house and a well. A date palm and an elm tree planted out the front of the house were probably original. The Orton family had three properties in the area and each one had palm and elm trees. There used to be music lessons in the front room of the house and people used to travel from Penrith by horse and cart. The driveway to the house was an older section of The Northern Road (Bringelly Road) (Malcolm Turner, pers comm. 24 February 2016).

### 5.6.2 Curtilage information

The curtilage of the Weatherboard House, Shed and Old Dairy includes the house, associated buildings and area of old dairy and is shown on **Figure 5-1**.

### 5.6.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. While the property is associated with the important local industry of dairying, there is little physical evidence to demonstrate this connection.
B – Strong or special associations	Does not meet this criterion. The property does not demonstrate an association with a significant event, person or groups of people.

<sup>4</sup> The Bouffier family owned property to the east and west of The Northern Road from around 1900 to 1950 and were cattle dealers who supplied the market in Sydney (Paul Davies Pty Ltd 2007: 155).

NSW Criterion	Assessment
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The property demonstrates little aesthetic values and does not demonstrate any particularly creative or technical achievement.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The property has no strong or special associations with a particular community or cultural group.
E – Potential to yield information	Does not meet this criterion. The property has no archaeological or research potential.
F – Uncommon or rare	Does not meet this criterion. The property is not rare in this region. There are many properties in this region of a similar age. The property does not possess uncommon, rare or endangered aspects of NSW's cultural history.
G – Principal characteristics of a class	Does not meet this criterion. The property is not particularly representative of a dairying operation as much of the original is not present.

#### 5.6.4 Statement of significance

While item 5 is associated with the important historical industry of dairying and early settlement of the area, the remains of the dairy (if any) and existing house have the potential to provide very limited information about the industry. The site is potentially associated with the Bouffier family with ties to the local area, however, the item is considered to have insufficient significance to fulfil the criteria for State or local listing.



**Figure 5-22** : House, facing east. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-23** : Front verandah of house, facing north. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-24** : Slab hut, facing east. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-25** : View inside slab hut, facing south-west. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-26** : Window detail, slab hut, facing north-east. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-27** : Location of previous dairy, facing south-west. Photo taken by Jennifer Chandler on 24 February, 2016.



## 5.7 Item 6: Weatherboard House and Sheds, Luddenham

### 5.7.1 Description and history

Item 6 is located on Lot A DP160890 at 2825 The Northern Road Luddenham and was surveyed on 24 February 2016 (Survey Area No. 4-4). No areas of archaeological potential were identified during the field survey at this heritage item. There was no evidence of ruins, bottle dumps, grass covered mounds that would indicate any areas of archaeological potential. The potential for archaeological deposits is considered to be unlikely.

This site comprises an old weatherboard house, sheds and stockyards described as follows:

- The weatherboard house has a hipped corrugated iron roof, with a gabled roof at a section at the back of the house which is an extension. It appears that there was two front doors in the building. It has a wide front verandah and small verandah on the back extension. A carport has been added to one side of house. There is a chimney on the back extension. The house is in a poor condition (**Figure 5-29, Figure 5-30**)
- Sheds – There is one large shed with a smaller one to the south, immediately adjacent. Both sheds have timber internal frames and green corrugated iron walls and gabled roof. Both roof beams and the frame are hand sawn on both buildings (**Figure 5-31, Figure 5-32**)
- Stockyards – A set of timber stockyards are located to the east of both sheds.

This property was originally part of a land grant to John Blaxland called Stockwood Farm. The land was 600 acres in size and granted on 31 August 1819. A full title search for this property was unsuccessful due an old system number preventing further tracking of the land title.

According to local Luddenham residents, a local butcher called Jim Roots is said to have lived in the house at this site (Nancy Sales, pers comm., 6 April 2016; Malcolm Turner, pers comm., 24 February 2016). A 1929 photo shows JW Roots slaughterhouse in Luddenham but it is unknown where the exact location is and whether it is associated with item 6 (**Figure 5-28**).

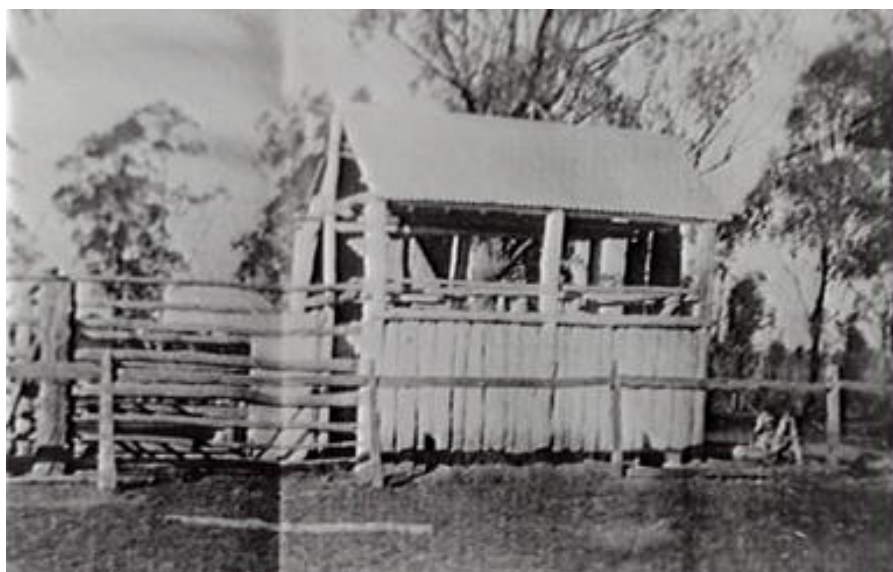


Figure 5-28 : 1929 photo of J W Roots slaughterhouse, Luddenham (Penrith City Council 2016).

### 5.7.2 Curtilage information

The curtilage of Weatherboard House and Sheds includes the house, sheds and stockyards as described above and is shown on **Figure 5-1**.

### 5.7.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. There is no physical evidence to demonstrate a connection with historically important activities or processes.
B – Strong or special associations	Does not meet this criterion. While the property is potentially associated with the Roots family, a well-known butchering family with ties to the local area, this association is considered insufficient to meet the criteria.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The property is not a major work by a designer or artist, and does not display any particularly aesthetic features.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The property has no strong or special associations with a particular community or cultural group.
E – Potential to yield information	Does not meet this criterion. The property has no archaeological or research potential.
F – Uncommon or rare	Does not meet this criterion. The property is not rare. There are many properties in this region of a similar age. The property does not possess uncommon, rare or endangered aspects of NSW's cultural history.
G – Principal characteristics of a class	Does not meet this criterion. The property does not demonstrate any particularly important characteristics of a farm house or butchery.

### 5.7.4 Statement of significance

Item 6 is potentially associated with the Roots family, a well-known butchering family with ties to the local area through much of the 20<sup>th</sup> century. The house is in poor condition, and the sheds do not appear directly associated with the activity of butchering. Therefore the heritage item has limited potential to provide information about the activity of butchery and supply of meat to the local population. The item is considered to have insufficient significance to fulfil the criteria for State or local listing.



**Figure 5-29** : House front, facing north-west. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-30** : House back, facing north. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-31** : Shed, facing south. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-32** : Inside of shed, facing south-west. Photo taken by Jennifer Chandler on 24 February, 2016.



## 5.8 Item 7: 'Pleasantview' House 1, Luddenham

### 5.8.1 Description and history

Item 7 is located on Lot 100 DP846962 at 2422-2430 The Northern Road, Luddenham and was surveyed on 24 February 2016 (Survey Area No. 4-7). No areas of archaeological potential were identified during the field survey at this heritage item. There was no evidence of ruins, bottle dumps, grass covered mounds that would indicate any areas of archaeological potential. The potential for archaeological deposits is considered to be unlikely.

There are three houses present on the 'Pleasantview' property. House 1 is located within the construction footprint (**Figure 5-33, Figure 5-34**). House 2 is modern and located outside the footprint and House 3 is the original homestead and also located outside the footprint. This assessment only includes House 1.

House 1 is of weatherboard construction with a gabled roof. The original roof was damaged in a storm and it now has a modern roof. There is a brick chimney on the southern side of the house. There is cement sheeting, louvre windows and a small enclosed verandah on the west side of the house.

The property owner stated that he brought the building to the property in around the 1930s-1940s and that it was originally the Llandilo Hall (Kenneth Hughes, pers. comm, 24 February 2016). Background research has determined that there was a new hall built at Llandilo around the time that the owner says he transferred the hall to the 'Pleasantview' property. The original hall was called the Llandilo School of Arts. In 1915 the hall was still uncompleted with 'bare walls' (NT, 31 July 1915). No other historical information about either 'Pleasantview' or the Llandilo Hall was able to be found during this assessment.

House 1 is in moderate condition but has been subject to modification. House 1 appears to have the style of a residence, rather than the appearance of a community hall. There is little information on the history of the Llandilo Hall, and having been relocated to its current position does not add to the building's significance.

### 5.8.2 Curtilage information

The curtilage of 'Pleasantview' House 1 is shown on **Figure 5-1**.

### 5.8.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. While the house is likely the original Llandilo Hall, it is not in its original location and has been heavily modified. It therefore does not demonstrate any particular aspect of NSW's history.
B – Strong or special associations	Does not meet this criterion. The property does not demonstrate an association with a significant event, person or groups of people.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The property does not appear to have any particular aesthetic or architectural characteristics of note.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. There is no evidence that the property has strong or special associations with a particular community or cultural group.
E – Potential to yield information	Does not meet this criterion. The property has no archaeological or research potential.

NSW Criterion	Assessment
F – Uncommon or rare	Does not meet this criterion. The property is not rare in this region. The property does not possess uncommon, rare or endangered aspects of NSW's cultural history.
G – Principal characteristics of a class	Does not meet this criterion. The property does not demonstrate any principal features of a community hall.

#### 5.8.4 Statement of significance

There is little information on the history of the Llandilo Hall and its importance to the original community, and having been relocated to its current position does not add to the building's significance. House 1 does not demonstrate any principal features of a community hall. It also does not appear to have any particular aesthetic or architectural characteristics of note. The item is therefore considered to have insufficient significance to fulfil the criteria for State or local listing.



**Figure 5-33** : House 1, facing north-east. Photo taken by Jennifer Chandler on 24 February 2016.



**Figure 5-34** : House 1, facing east. Photo taken by Jennifer Chandler on 24 February 2016.

## 5.9 Item 8: 'Luddenham Village' area: Chapel and School Site and Adams Road House

### 5.9.1 Description and history

Item 8 includes the following lots: Lot 21 DP614481, Lots 22-25 DP700302 and Lot 1 DP7136725 located at 12-26 Eaton Road and 5 Adams Road, Luddenham. Lot 25 DP700302, is a large area including several shops to the west of four houses on Eaton Road (2130 The Northern Road). The properties inside the construction footprint and also at 5 Adams Road were surveyed on 25 and 26 February 2016 (Survey Area No. 4-12 and 4-23).

A previous archaeological assessment (Artefact Heritage 2015: 44) found that there was potential for structural remains of buildings and for burials at the broader Luddenham Village site; however, the current field survey was confined to a small section of the area thought to be the Luddenham Village area and no areas of archaeological potential were identified. There was no evidence of ruins, bottle dumps, grass covered mounds that would indicate any areas of archaeological potential. The potential for archaeological deposits is considered to be unlikely.

Only the eastern-most section of the 'Luddenham village' area (Lot 21 DP614481) is located within the construction footprint. The 'Luddenham village' area contains four modern houses, shopping centre and open space. One of the four modern houses (**Figure 5-36, Figure 5-37**) is the only structure located within the construction footprint. An aerial image from 1965 shows the area with no houses (Australian Museum Consulting 2014: **Figure 4-32**). This heritage item was identified as a chapel and school site in the previous heritage assessment by Artefact Heritage (2015:28). The Chapel and School site was associated with Luddenham Village. The house and thick vegetation obscured the ground surface and no historical heritage items were identified within the survey area.

Lot 1 DP7136725 corresponds to the alignment and arrangement of the lots of the Luddenham Village subdivision. It contains an old house (5 Adams Road) (**Figure 5-38**) which is located adjacent to the construction footprint. It is therefore included in this assessment. An aerial image from 1965 (Australian Museum Consulting 2014: **Figure 4-32**) shows the house within a rural area. This lot contains a house located about 30 m outside the construction footprint. It is of weatherboard and cement sheeting construction with a green painted corrugated iron roof and a hedge out the front. While appearing much modified, the style of the house with its verandah, indicates it may date to the late 19<sup>th</sup> or early 20<sup>th</sup> century.

All of the area for this heritage item listing was originally part of a land grant to John Blaxland of 6,710 acres called Luddenham Estate, Eastern Division. In 1859 the land was subdivided into lots of one acre and half acres and called 'Luddenham Village'. The subdivision made provisions for a church, school and public reserve (Australian Museum Consulting 2014:24). Apart from newspaper advertisements for the sale of the lots within the village no reference was found relating to a church and school being built at the site. The Penrith Heritage Study (Paul Davies Pty Ltd 2007: 153) appears to suggest that the church was built: 'In the survey of 1859 a church reserve had been dedicated, but it was not until July 1871 that St James' Anglican Church was completed (LU-06)'. However, St James' Anglican Church is actually located to the west of The Northern Road on an entirely different block to that indicated in the 1859 plan (**Figure 5-35**). A title search for these properties was unsuccessful due the documents being unable to be traced back before 1963 on the land title search system.

### 5.9.2 Curtilage information

The curtilage of the Luddenham Village Area: Chapel and School Site, and Adams Road House as described above is shown on **Figure 5-1**.



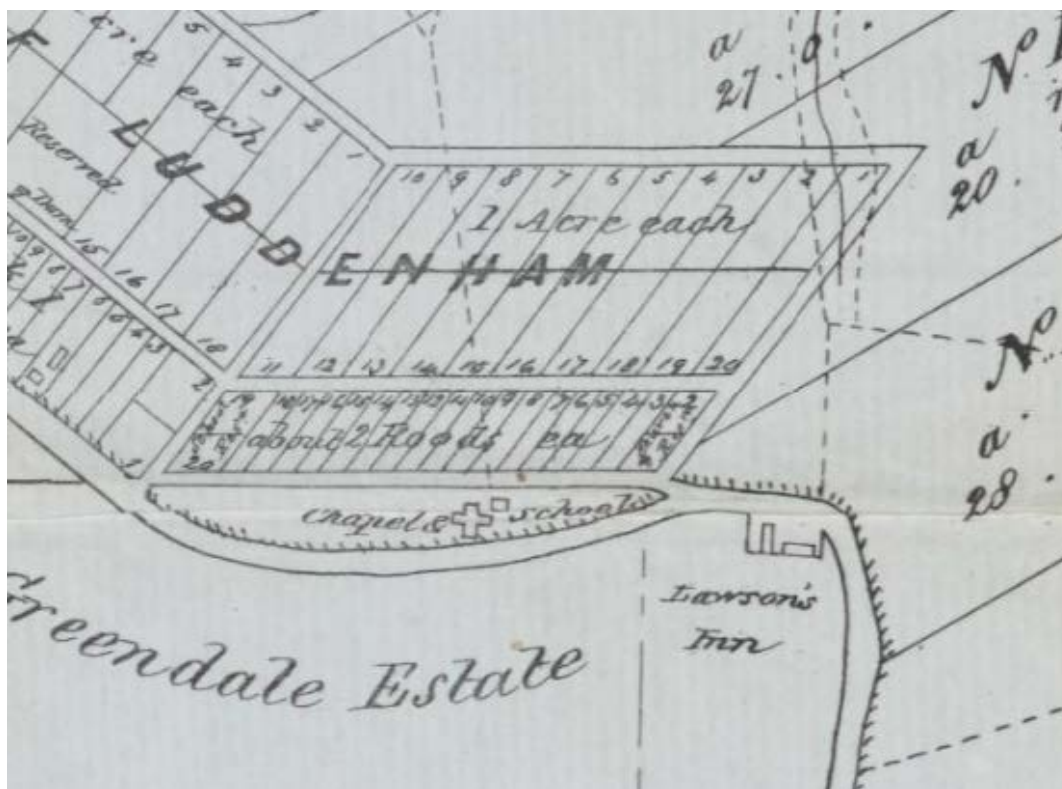


Figure 5-35 : Plan of the eastern division of the Luddenham Estate (cartographic material): to be sold by auction by Mr. R.P. Richardson/Samuel Jackson Surveyor. Source: National Library of Australia digitised item.

### 5.9.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. No physical evidence of Luddenham village was identified by this assessment as only a small section is within construction footprint which overlaps with modern housing. Additionally it is unclear whether Luddenham Village was ever substantially developed.
B – Strong or special associations	Does not meet this criterion. The heritage item does not demonstrate an association with a significant event, person or groups of people as it is unclear whether Luddenham Village was ever substantially developed.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The heritage item demonstrates little aesthetic values and does not demonstrate any particular creative or technical achievement as it is unclear whether Luddenham Village was ever substantially developed.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The heritage item has no strong or special associations with a particular community or cultural group as it is unclear whether Luddenham Village was ever substantially developed.

NSW Criterion	Assessment
E – Potential to yield information	Does not meet this criterion. The heritage item has no archaeological or research potential as there is modern housing at the site.
F – Uncommon or rare	Does not meet this criterion. The heritage item is not rare in this region and it is unclear whether Luddenham Village was ever substantially developed.
G – Principal characteristics of a class	Does not meet this criterion. The heritage item is not particularly representative and it is unclear whether Luddenham Village was ever substantially developed.

#### 5.9.4 Statement of Significance

Item 8 is associated with the early settlement of Luddenham, however it is not known whether a chapel or school were ever built at the site. Additionally there is little or no physical or historical evidence that the Luddenham Village was ever actually substantially developed. Even if the chapel and school did exist, it is unlikely that there are subsurface remnants of a chapel and school as they would be under the modern housing at this location. The Adams Road house is in poor condition and has been modified, and it is unclear whether it actually even dates to the time of the Luddenham Village development (mid-19<sup>th</sup> century). The lots therefore have limited potential to contribute information about early settlement of the area. The heritage item is considered to have insufficient significance to fulfil the criteria for State or local listing.



**Figure 5-36** : Current housing on the site, facing north. Photo taken by Jennifer Chandler on 25 February 2016.



**Figure 5-37** : Vacant area of land to the east of housing, facing west. Photo taken by Jennifer Chandler on 25 February 2016.



**Figure 5-38** : House located at 5 Adams Road, Luddenham, facing east. Photo taken by Amanda Goldfarb on 26 February 2016.



## 5.11 Item 9: Miss Lawson's Guesthouse Site, Luddenham

### 5.11.1 Description and history

Item 9 is located on Lot 1 DP90157 at 26 Adams Road, Luddenham and was surveyed on 25 February 2016 (Survey Area No. 4-13). Areas of archaeological potential were identified during the field survey and are outlined below, including figures showing the items identified during field survey. These items are also identified on **Figure 7-4**.

The site comprises:

- One shallow depression (well) with stone debris on the ground surface around the well, and several visible blocks inside the depression. About ten wooden planks (1.5 – 2 m long) located on the ground surface to the west of the depression (**Figure 5-39, Figure 5-40**).
- Another stone depression (well) with a nearby peppercorn tree (**Figure 5-41**)
- Cutting into the ground surface that is in line with the gate on Eaton Road on a north/south axis (**Figure 5-42**)
- Pieces of stone (squares/blocks) located near the gate on Eaton Road (**Figure 5-43**)

This property was originally part of a land grant to John Blaxland of 6,710 acres called Luddenham Estate, Eastern Division. In 1859 the land was subdivided into lots of one acre and half acres and called 'Luddenham Village' (Australian Museum Consulting 2014:24). A title search for this property was unsuccessful due the documents being unable to be traced back before 1963 on the land title search system.

This heritage item was identified in a previous assessment (Artefact Heritage 2015) as being associated with Lawson's Inn, which was operated by John Lawson between the 1830s and the 1880s. However, research undertaken for this assessment suggests that a woman called Miss Lawson (probably John Lawson's daughter) operated a guesthouse after Lawson's Inn had closed down, and was situated on the opposite side of The Northern Road to Lawson's Inn:

I am glad to find myself contemplating the old house that for so many years was the village inn. I write 'was' because it was its day as a public house for the entertainment of man and beast have gone. No longer does 'The Thistle' [Lawson's Inn] beam across the roadway a welcome invitation to the tired traveller, with money in his purse. But the old house still remains a quaint memorial of the 'have beens' – a kind of architectural milestone on time's roadway reminding us of approaching old age. Opposite this house is a neat cottage, where decent travellers may be provided with comfortable and clean bed and board at reasonable charge by Miss Lawson – and thither I wended my way. The road takes a turn on passing Miss Lawson's, and the visitor may look across and see the whole of the remaining part of Luddenham at once, for most of the buildings front the roadway, and the majority of them face the east, and thus catch the morning sun, which imparts a cheerful aspect to the scene (NT, 10 August 1907).

Apart from demolition of the guesthouse building, the site would have been subject to only low levels of disturbance as it is located within a large paddock which has not been subject to recent construction from housing, roads or utilities. The paddock appears to have been used primarily for grazing. There was no evidence of deposits noted during the field survey but the entire ground surface was covered with thick, long grass which would have obscured any less obvious features. The grass was also thicker in the depression/stone block areas, making it difficult to determine whether the depressions were infilled with stone or shallow in original depth. Information from the property owner, Nancy Sales, (pers. comm., 6 April 2016) indicates that the guesthouse kitchen was the only part of the building remaining when the property was bought by her father-in-law in the 1940s and that it was located near the existing peppercorn tree. Nancy Sales, also confirmed that it was known to have been the 'inn' owned by Cassie Lawson.

Inns and hotels were the earliest community site types to be built in the region and were located along main roads in order to cater to travellers. They were in use until railway lines were introduced into the region and road travel decreased. In the later 19<sup>th</sup> and early 20<sup>th</sup> century guesthouses came into use. They were a revival of the inn and hotel service and made use of existing old estates as well as being in new purpose-built buildings (Thorp 1986:87-88).

The guesthouse site has the potential to yield information relating to the operation of, and custom of, guesthouses operating in the early 20<sup>th</sup> century in western Sydney. There is potential for information to be obtained about the materials that people were transporting at the time, and the nature, scale and extent of the guesthouse. Comparisons with other inns in operation at this time can also be made.

### 5.11.2 Curtilage information

The curtilage of the Miss Lawson's Guesthouse Site includes the wells, wooden items, road cutting and peppercorn tree as described above and is shown on **Figure 7-4**.

### 5.11.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Miss Lawson's Guesthouse Site demonstrates a historical change in the way people travelled. For example, a revival of the inn and hotel business after a period of declined road travel.
B – Strong or special associations	The guesthouse is also associated with the Lawson family who had ties to the local area throughout the late 19 <sup>th</sup> and early 20 <sup>th</sup> century.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. As there are no extant buildings or structure related to the original guesthouse the site does not demonstrate any design or technical integrity.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The guesthouse has no strong or special associations with a particular community or cultural group.
E – Potential to yield information	Potential to yield information about guesthouses and guests during the early 20 <sup>th</sup> century.
F – Uncommon or rare	Does not meet this criterion. The guesthouse does not meet the criterion or possess uncommon, rare or cultural history. Guesthouses and inns were common along main roads in NSW at this period of time.
G – Principal characteristics of a class	Does not meet this criterion. As there are no extant buildings or structures related to the original guesthouse it does not demonstrate any particular characteristics of a type.

### 5.11.4 Statement of significance

The site is of historical significance in demonstrating the change in the area relating to road use and travel. The site is also associated with a family with ties to the local area through the late 19<sup>th</sup> and 20<sup>th</sup> century. The wells are potentially related to the occupation and use of the guesthouse, and given the low level of disturbance or development at the site, there is potential for other archaeological remains and deposits to be present at the site. These archaeological remains have the potential to provide information about the operation of, and custom

of, guesthouses operating in the early 20<sup>th</sup> century in western Sydney. There is potential for information to be obtained about the materials that people were transporting at the time, and the nature, scale and extent of the guesthouse. Comparisons with other inns in operation at this time can also be made. The item is considered to have sufficient significance to fulfil the criteria for local listing.





**Figure 5-39** : Well 1, facing north. Photo taken by Jennifer Chandler on 25 February 2016.



**Figure 5-40** : Timber located near well 1, facing north. Photo taken by Jennifer Chandler on 25 February 2016.



**Figure 5-41** : Well 2, facing east. Photo taken by Jennifer Chandler on 25 February 2016.



**Figure 5-42** : Possible road cutting near Eaton Road, facing south. Photo taken by Jennifer Chandler on 25 February 2016.



**Figure 5-43** : Stone blocks near gate on Eaton Road, facing north-east. Photo taken by Jennifer Chandler on 25 February, 2016.

## 5.12 Item 10: Lawson's Inn Site

### 5.12.1 Description and history

The Lawson's Inn site is currently listed on the Liverpool LEP but as this assessment and previous heritage assessments (Artefact Heritage 2015; Australian Museum Consulting 2014) have determined, the location of the listing on the LEP (Lots 1 & 2 DP851626) is not the actual location of Lawson's Inn.

Lot 2 DP623457 has been identified as the correct location of Lawson's Inn, and is situated on the opposite side of The Northern Road, to the north of the LEP listed location. Lot 2 DP623457 was surveyed on 26 February, 2016. Areas of archaeological potential were identified during the field survey and are outlined below and indicated in **Figure 5-49** and **Figure 5-50**. These are also shown on **Figure 7-5**.

The property is currently used as a Christmas tree farm. There are existing rows of trees across the entire property with grass cover between the tree rows. Although most of the grass cover was long, there were some sections which had been slashed. There was some small areas of ground surface visibility located between the tree rows due to erosion by vehicle tracks. There is limited physical archaeological evidence related to Lawson's Inn on the ground surface of Lot 2 DP623457. However, ceramic and glass fragments, and several stone blocks were located on the property (**Figure 5-51**, **Figure 5-52**, **Figure 5-53**, **Figure 5-54**). The mostly glass fragments with lesser amounts of ceramic were found in a scatter about 100 m x 8 m with a maximum density of about 2 per square metre. The dark green, blue, clear and brown glass appeared to be late 19th/early 20th century with some thick bottle base fragments noted. The scatter was located in the north of the block, near Eaton Road in areas of ground surface visibility, between tree plantings, in a location that corresponds with the vicinity of Lawson's Inn as marked on the 1959 plan (**Figure 5-45**). The stone blocks are painted white and currently mark out vehicle tracks on the Christmas tree farm and may not be associated with Lawson's Inn. Apart from demolition of the inn building the site would have been subject to only low levels of disturbance as it is located within a paddock which has not been subject to recent construction from housing, roads or utilities. The paddock appears to have been used primarily for grazing and Christmas tree production. There was no evidence of deposits noted during the field survey but much of the ground surface was covered with grass and trees which would have obscured any less obvious features.

This property was originally part of a land grant to John Blaxland of 6,710 acres called Luddenham Estate, Eastern Division in 1813. In 1843 the land passed to Francis Walker and then to John Lawson in 1860. A plan of the Central and Western Divisions of Luddenham from 1859 clearly shows Lawson's Inn located to the south of The Northern Road (Bringelly Road) (**Figure 5-43**). A survey plan dated April 1859 shows the inn as 'Lawson's Store' (**Figure 5-44**). An undated plan and an undated Parish map show where the sharp corner at Lawson's Inn has been straightened and the old alignment of The Northern Road, now known as Eaton Road (**Figure 5-45**, **Figure 5-46**) is situated. Lawson's Inn (also known as The Thistle Inn) was likely constructed in the 1830s after The Northern Road was built in the 1820s. Lawson's Inn was owned by John Lawson and his wife, Ann Lawson. It was an inn and a store. John died in 1885 aged 84 and Ann died in 1894 aged 71. They had nine children together, two of whom had passed away before her death in 1894. According to her will the property was to be divided among the remaining seven children (NT, 3 November 1894, 1 October 1932). In 1897 ownership of the land passed to Kate Megarrity (formerly Kate Lawson, John Lawson's daughter). In 1915 ownership of the land passed to the Vicary family. A photograph (**Figure 5-44**) included in a local history book (Willmington 2013:8) about Luddenham reportedly shows the Lawson family in front of the inn although there is no source given for the photograph.

The site of Luddenham Village may have been chosen next to Lawson's Inn as it was already a popular place for travellers to stop. In the 1860s Lawson's Inn functioned as a public meeting place for locals as well as supplying goods. Lawson's Inn was demolished in the mid-20<sup>th</sup> century (Australian Museum Consulting 2014:55).

In 1907 what remained of the Lawson's Inn building, Luddenham village and a building opposite the Inn where travellers could stay which was run by Miss Lawson (most likely John Lawson's daughter) was described as follows:



I am glad to find myself contemplating the old house that for so many years was the village inn. I write 'was' because it was its day as a public house for the entertainment of man and beast have gone. No longer does 'The Thistle' beam across the roadway a welcome invitation to the tired traveller, with money in his purse. But the old house still remains a quaint memorial of the 'have beens' – a kind of architectural milestone on time's roadway reminding us of approaching old age (NT, 10 August 1907).

Lawson's Inn, also still being called the Thistle Inn, was confirmed as long having closed by the beginning of the 20<sup>th</sup> century, but was still being remembered (*Windsor and Richmond Gazette*, 2 October 1909).

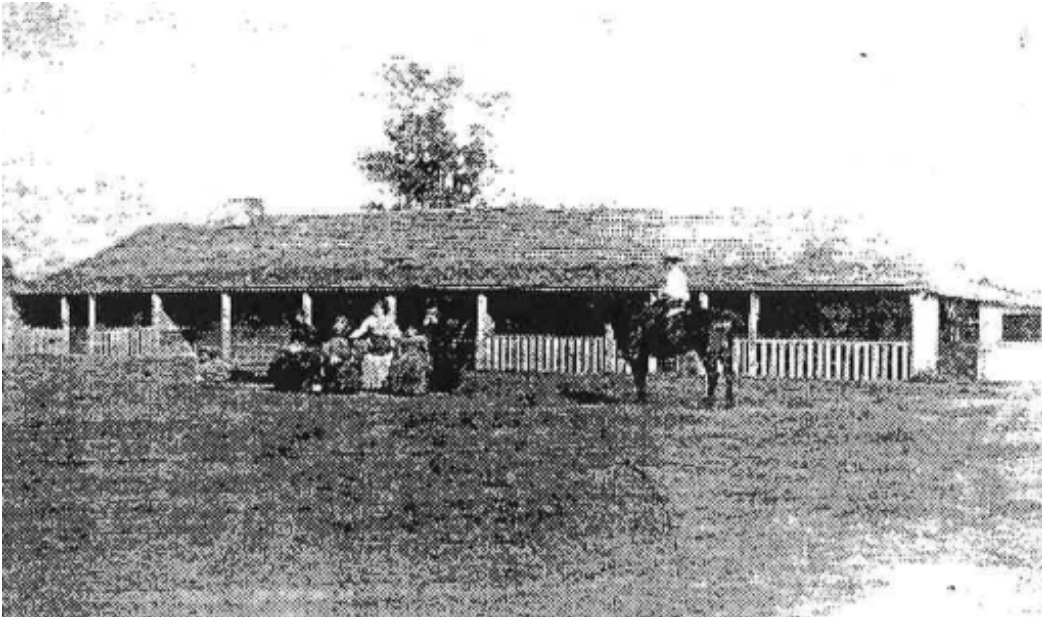


Figure 5-44 : Photo from Willmington (2013:8) titled 'The Thistle with the Lawson family'.



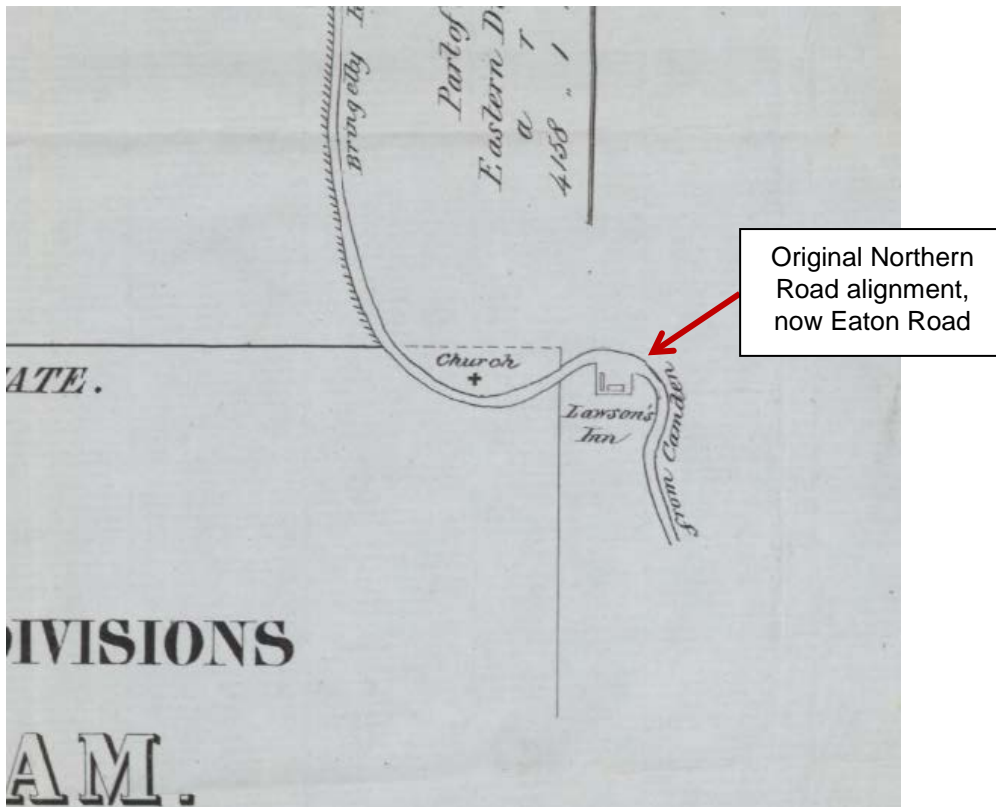


Figure 5-45 : 1859 Plan of the central and western divisions of Luddenham: to be sold by public auction by Mr. R.P. Richardson/Samuel Jackson Surveyor. Source: Trove, National Library of Australia 2016.



Figure 5-46 : Lithographic plan surveyed in April 1859 (173) Source: State Records Authority of NSW.

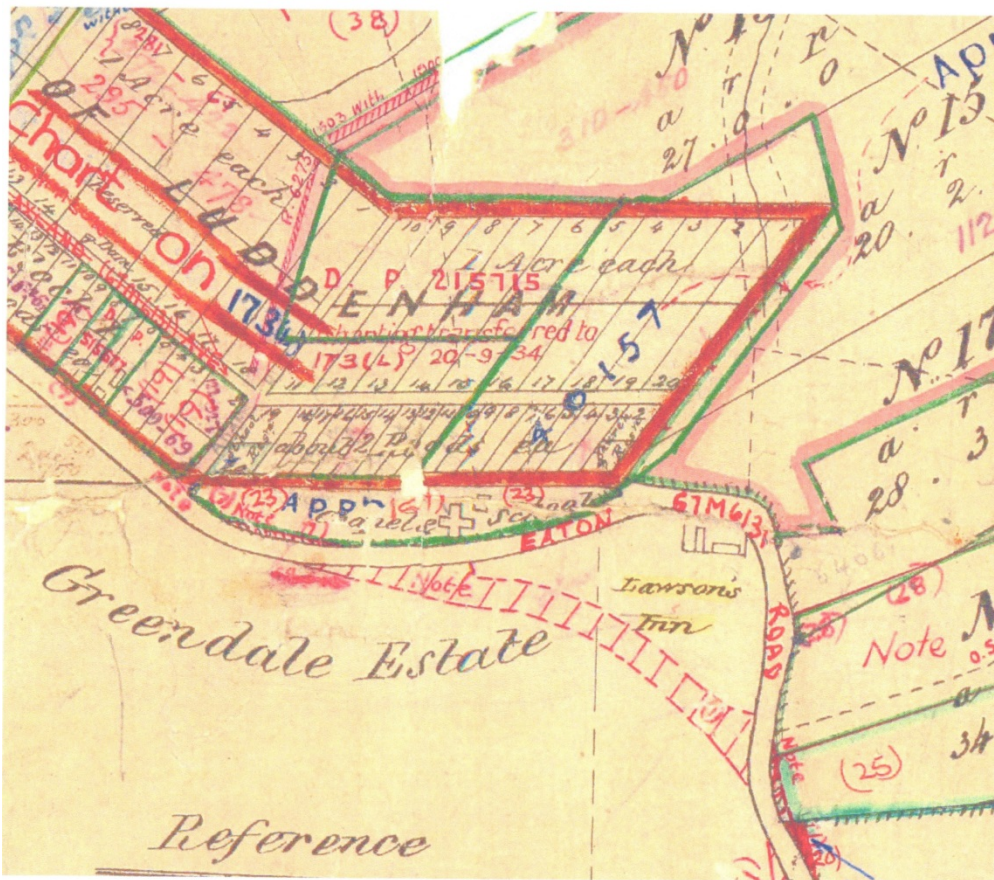


Figure 5-47 : Undated plan showing Lawson's Inn buildings and new section of The Northern Road. Roll Plan 4 (Source: State Records Authority of NSW).



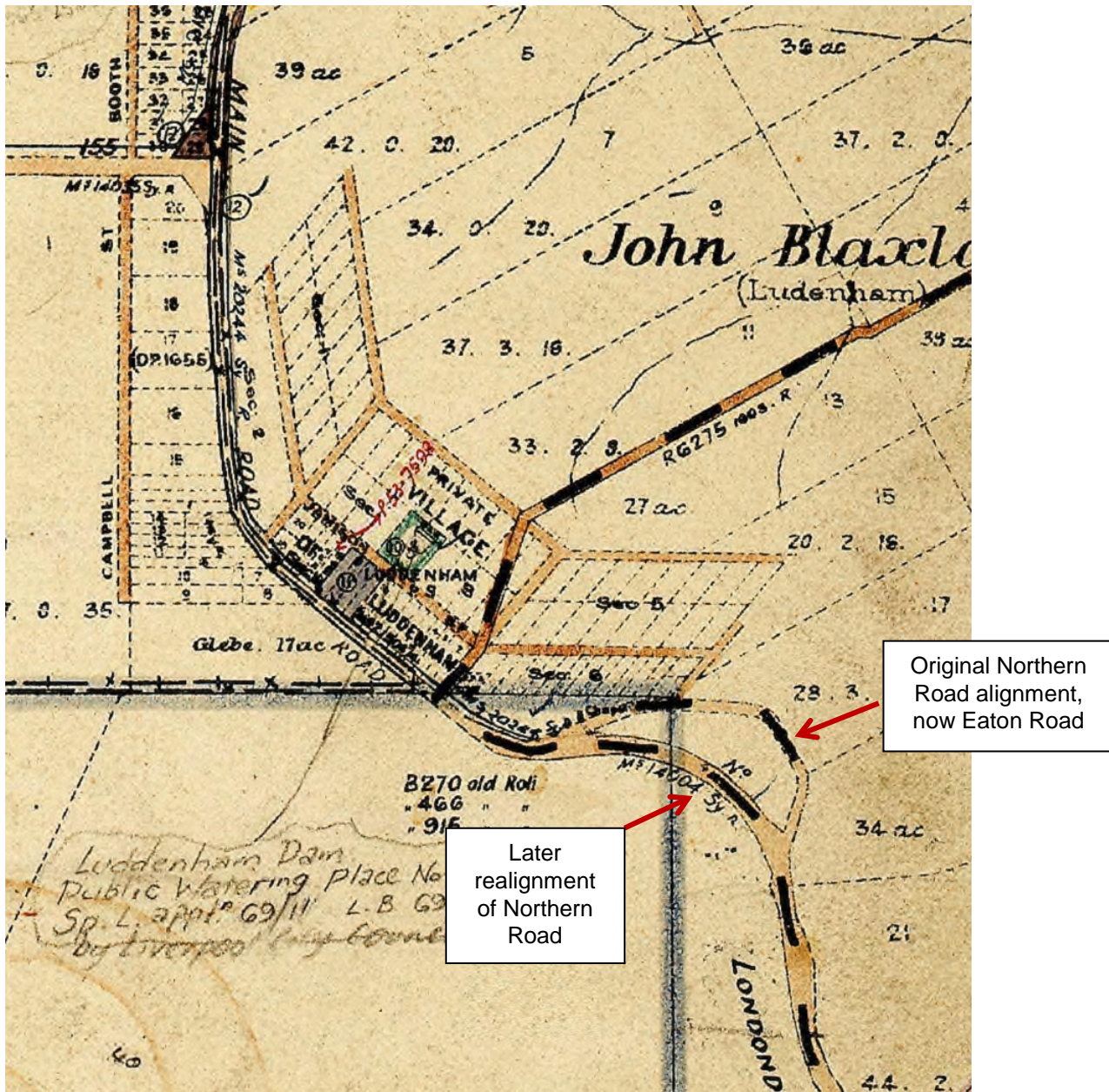
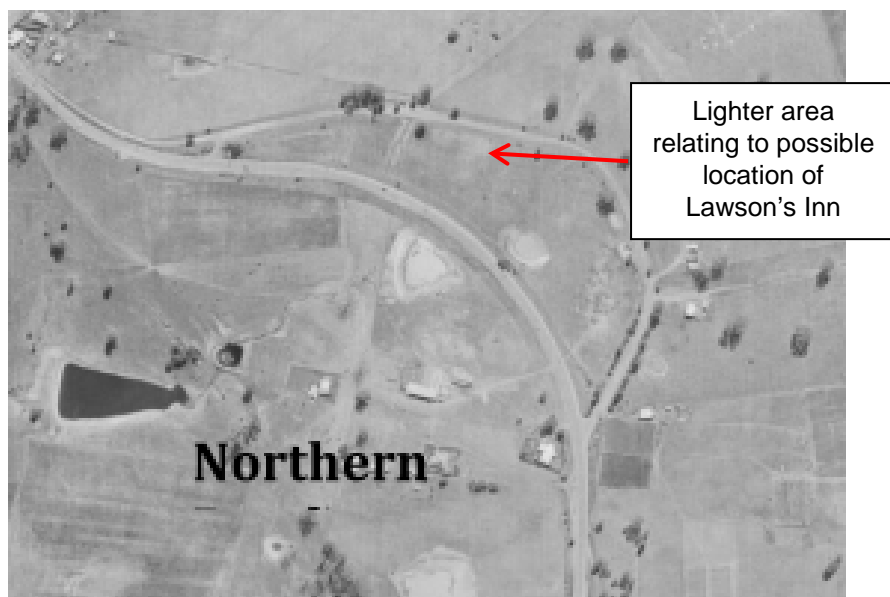


Figure 5-48 : Undated Parish map showing straightening/realignment of The Northern Road. Source: Extract from parish map, County of Cumberland, Parish of Bringelly.

The Lawson's Inn site has been used for Christmas tree production and has therefore been subject to ground disturbance associated with tree production. The Christmas tree farm does not appear to have been established until after 1986, as aerial images sourced by Australian Museum Consulting (2014: Figure 4-32) show no evidence of the farm at that time. It is uncertain what the property has been used for between the time of the removal of the Lawson's Inn building and the establishment of the Christmas tree farm. A black and white aerial image from 1965 (Australian Museum Consulting 2014: Figure 4.32) shows the property before the land was used for Christmas tree production. There is a lighter coloured area on the ground surface which corresponds with the predicted location for the inn. This may indicate a change in vegetation, soil or possible location of the previous building. A field survey failed to locate any building footings associated with the site but did identify fragments of late 19<sup>th</sup>/early 20<sup>th</sup> century ceramics and glass in the lighter coloured area (Figure 5-49). A plan superimposed onto an aerial of the property also indicates the location of Lawson's Inn (Figure 5-50).





**Figure 5-49** : 1965 aerial of the Lawson's Inn site. Source: Land and Property Information in Australian Museum Consulting 2014: Figure 4.32.

The Lawson's Inn site is currently listed on the LLEP (53) and is classed as an archaeological-terrestrial type of item on the OEH listing. While the location on the LEP is incorrect, the existing 2004 Statement of Significance (OEH 2016) is of relevance and states:

The site of Lawson's Inn at Luddenham demonstrates the history of the early settlement of the area. The Inn formed the nucleus of the development of Luddenham which was laid out adjacent to the site in 1864. The site's location beside a major road is indicative of the importance of the early transport networks in facilitating settlement and development and is representative of early Inn and Hotel sites throughout the Sydney region. There is potential to gain more information on the site from further archaeological and documentary research.

The recommended management for this heritage place is that 'prior to any redevelopment or subdivision of this area an archaeological assessment (both Aboriginal and non-Aboriginal) should be undertaken'.

Australian Museum Consulting (2014: 56) reviewed the LLEP listing and viewed the LLEP site from The Northern Road, for Lawson's Inn and concluded that the site would be considered to be a State significant archaeological site:

The lack of extensive development in the local area indicates that the integrity of the archaeological resources associated with the site of Lawson's Inn, The Thistle, is likely to be good. In addition, the potential for the archaeological resources to provide information concerning the historic settlement and development of the local area that would not be available from any other source. As a focus for travellers, there is potential for the archaeological resources to provide information concerning the transport of goods and the mechanisms of the everyday lives of people living in a rural environment at a distance from urban centres.



**Figure 5-50** | Plan superimposed onto aerial showing location of Lawson's Inn



### 5.12.2 Curtilage information

The curtilage of Lawson's Inn is shown on **Figure 7-5** and comprises the area of land between the old The Northern Road alignment (Eaton Road) and the new The Northern Road alignment which is where Lawson's Inn was located.

### 5.12.3 Significance assessment

The existing significance assessment for Lawson's Inn meets criterion A, E and G. This current assessment concurs with the existing significance assessment as detailed below.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	The site demonstrates the history of settlement within the area of Luddenham and reflects the importance of early major road networks in facilitating the development of such urban centres.
B – Strong or special associations	The Lawson family was a well-known family in the Luddenham district from the mid-19 <sup>th</sup> century to the mid-20 <sup>th</sup> century. They were associated with proprietorship of inns/guesthouses.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. As there are no extant buildings or structures, the inn does not demonstrate any design or technical integrity.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The inn has no strong or special associations with a particular community or cultural group.
E – Potential to yield information	There is the potential to gain more information on the site from further archaeological and documentary research.
F – Uncommon or rare	Does not meet this criterion. There is likely to be better examples and more intact sites of early hotels/inns in NSW than this example.
G – Principal characteristics of a class	The site is representative of the location of many early hotel and inn sites, on a major road network, in the Sydney area.

### 5.12.4 Statement of significance

The site of Lawson's Inn at Luddenham demonstrates the history of the early settlement of the area. The Inn formed the nucleus of the development of Luddenham which was laid out adjacent to the site in 1864. The site's location beside a major road is indicative of the importance of the early transport networks in facilitating settlement and development and is representative of early Inn and Hotel sites throughout the Sydney region. The site is also associated with a family with ties to the local area through the late 19<sup>th</sup> and 20<sup>th</sup> century. There is potential to gain more information on the site from further archaeological and documentary research, due to its local heritage significance.





**Figure 5-51** : Location of Lawson's Inn site, facing north. Photo taken by Jennifer Chandler on 26 February 2016.



**Figure 5-52** : Area where ceramic and glass fragments are located, facing west. Photo taken by Jennifer Chandler on 26 February 2016.



**Figure 5-53** : Some of the glass fragments located on the site. Photo taken by Jennifer Chandler on 26 February 2016.



**Figure 5-54** : Painted stone block. Photo taken by Jennifer Chandler on 26 February 2016.

### 5.13 Summary

Of the 10 potential heritage items assessed, only four have been assessed as having heritage significance. **Table 5-1** summarises the significance of each of the heritage items. The six which are not of significance are not further considered in this assessment. Statements of Heritage Impact are provided for each of the four heritage items in **Section 0**.

Table 5-1 : List of heritage items within and immediately adjacent to the project

Heritage item number	Source	Heritage item name	Significance
Item 1	Artefact Heritage (2015)	Remnants of The Northern Road	None
Item 2	CHL, RNE	Orchard Hills Cumberland Plain Woodland	Commonwealth
Item 3	Paul Davies Pty Ltd (2007)	Warragamba Dam to Prospect Reservoir pipeline	Local
Item 4	NA	Fruit Orchard, Luddenham	None
Item 5	NA	Weatherboard House, Slab Hut and Old Dairy, Luddenham	None
Item 6	NA	Weatherboard House and Sheds, Luddenham	None
Item 7	NA	"Pleasantview' House 1, Luddenham	None
Item 8	Artefact Heritage (2015)	'Luddenham Village' area: Chapel and School Site and Adams Road House	None
Item 9	Artefact Heritage (2015)	Miss Lawson's Guesthouse Site, Luddenham	Local
Item 10	Liverpool LEP	Lawson's Inn Site	Local

## 6. Impact assessment

### 6.1 Proposed works

The project comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction). The wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and about 100 m south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham, to realign the section of The Northern Road that currently bisects the Western Sydney Airport site and to bypasses Luddenham
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and about 100 m south of Glenmore Parkway, Glenmore Park
- Closure of the existing The Northern Road through the Western Sydney Airport site
- Tie-in works with the following projects:
  - The Northern Road Upgrade, between Peter Brock Drive, Oran Park and Mersey Road, Bringelly (to the south)
  - The Northern Road Upgrade, between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith (to the north)
- New intersections including:
  - A traffic light intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport, incorporating a dedicated u-turn facility on the western side
  - A traffic light intersection for service vehicles accessing the Western Sydney Airport, incorporating 160 m of new road connecting to the planned airport boundary
  - A traffic light intersection connecting the realigned The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham
  - A 'give way' controlled intersection (that is, no traffic lights) connecting the realigned The Northern Road with Eaton Road (east of the new alignment, left in, left out only)
  - A four-way traffic light intersection formed from the realigned Elizabeth Drive, the realigned The Northern Road and the existing The Northern Road, north of Luddenham
  - A traffic light intersection at the Defence Establishment Orchard Hills entrance, incorporating a u-turn facility
- New traffic lights at four existing intersections:
  - Littlefields Road, Luddenham
  - Kings Hill Road, Mulgoa
  - Chain-O-Ponds Road, Mulgoa
  - Bradley Street, Glenmore Park incorporating a u-turn facility
- Modified intersection arrangements at:
  - Dwyer Road, Bringelly (left in, left out only)
  - Existing Elizabeth Drive, Luddenham (left out only)
  - Gates Road, Luddenham (left in only)



- Longview Road, Luddenham (left in, left out only)
- Grover Crescent south, Mulgoa (left in only)
- Grover Crescent north, Mulgoa (left out only)
- Dedicated u-turn facilities at:
  - The existing The Northern Road at Luddenham, south-west of Elizabeth Drive
  - The existing Elizabeth Drive, Luddenham around 800 m east of The Northern Road
  - Chain-O-Ponds Road, Mulgoa
- Twin bridges over Adams Road, Luddenham
- Local road changes and upgrades, including:
  - Closure of Vicar Park Lane, east of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, west of the realigned The Northern Road, Luddenham
  - Eaton Road cul-de-sac, east of the realigned The Northern Road, Luddenham
  - Elizabeth Drive cul-de-sac, about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive, Luddenham
  - Extension of Littlefields Road, east of The Northern Road, Mulgoa
  - A new roundabout on the Littlefields Road extension, Mulgoa
  - A new service road between the Littlefields Road roundabout and Gates Road, including a 'give way' controlled intersection (that is, no traffic lights) at Gates Road, Luddenham
  - Extension of Vineyard Road, Mulgoa between Longview Road and Kings Hill Road
  - A new roundabout on the Vineyard Road extension at Kings Hill Road, Mulgoa
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required
- The upgrading of drainage infrastructure
- Operational ancillary facilities including:
  - Heavy vehicle inspection bays for both northbound and southbound traffic, adjacent to Grover Crescent, Mulgoa and Longview Road, Mulgoa respectively
  - An incident response facility on the south-western corner of the proposed four-way traffic light intersection at Elizabeth Drive, Luddenham
- New traffic management facilities including variable message signs (VMS)
- Roadside furniture and street lighting
- The relocation of utilities and services
- Changes to property access along The Northern Road (generally left in, left out only)
- Establishment and use of temporary ancillary facilities and access tracks during construction
- Property adjustments as required
- Clearance of undetonated explosive ordinance (UXO) within the Defence Establishment Orchard Hills as required.

## **6.2 Summary of potential impacts**

### **6.2.1 Historic heritage**

The proposed activities within or adjacent to each heritage item identified for this assessment and the potential impacts of these activities is presented in **Table 6-1**.

A detailed assessment of impacts is provided in the Statements of Heritage Impact in **Section 7**.

Table 6-1 : Potential impacts from proposed works for each heritage item

Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
Item 2	Orchard Hills Cumberland Plain Woodland	105317 (CHL) 102211 (RNE)	Clearing of vegetation and construction of carriageway and associated fill slope as well as associated drainage and flood retardation works	<p>Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values of the site through native vegetation removal and associated habitat loss, as well as impacts to the historic heritage values of the site as a result of impacts to the Chaffey Brothers Irrigation Scheme Canal (the canal). These potential impacts are summarised below.</p> <p>The main impacts to natural heritage are as a result of clearing of around 9.68 ha of native vegetation within the western periphery of the CHP (Sectors B and H). However this is equivalent to only around 1.3% of the total 726.32 ha of native vegetation within the CHP. The majority of these areas are made up of a mix of regrowth natural vegetation communities identified in the HMP for the DEOH as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). There is also a small patch of relic native trees associated with two trees located within the north-western portion of the CHP that would also be impacted by the project. This area is identified as having moderate natural heritage significance (Godden Mackay Logan 2013). Of the impacted areas, none are identified as remnant vegetation communities which are ranked as high natural heritage significance in the HMP.</p> <p>The regrowth natural vegetation communities have been identified as having a reasonable tolerance for change, being that this element and its key attributes have relatively little heritage value, but may contribute to the overall significance of the site. In general, the element can be altered to a reasonable degree provided it does not impact the heritage values of the site (Godden Mackay Logan 2013). In the context of the CHP overall, impacts to regrowth natural vegetation communities as well as grasslands are expected to be minimal and are therefore considered reasonable. Given this and the moderate to low heritage significance of these elements, impacts as a result of the project are not expected to be significant.</p> <p>Relic native trees have been identified as having a low tolerance for change,</p>



Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
				<p>being that this element and its key attributes embody heritage values, retaining a high degree of intactness with no major change or alterations, or only minor alterations that do not detract from the heritage values. In general, the element should be retained and conserved (Godden Mackay Logan 2013). Although impacts to relic native trees in the overall context of the CHP as a result of the project would be minimal, given their moderate natural heritage significance and low tolerance for change, impacts to this element as a result of the project are considered moderate.</p> <p>The aquatic environment within the CHP that is ranked in the HMP as being of moderate to high significance (Godden Mackay Logan 2013) is not expected to be impacted by the project due to the distance from the works and the proposed application of effective mitigation measures.</p> <p>Potential impacts to the historic heritage values of this item are related to impacts to the canal located within the south-western portion of the CHP (Sector H of the DEOH). The canal is ranked as high significance in the HMP (Godden Mackay Logan 2013). Construction would overlap with only 2.43% of the northern part of the canal, some of which is in poor condition as it is extremely shallow from erosion. The canal and the area in which is situated (Sector H) has a low tolerance for change in relation to new development and demolition/remediation. However, given the project is impacting a small proportion of the overall canal on DEOH land, and that the section being impacted is of relatively poor quality due to erosion, the overall impact on the historic heritage values are not considered to be significant.</p> <p>Vibration is unlikely to impact the canal due to the structural nature of the canal and vegetation on the canal.</p>
Item 3	Warragamba Dam to Prospect Reservoir pipeline	-	Construction of carriageway and fill slope. Drainage infrastructure upgrades comprising a concrete drainage channel along the northern perimeter of the Water NSW Precinct (north of the pipeline) and an access track to the east of The Northern Road.	<p>The Northern Road carriageway construction is confined to section of pipeline that is underground. No impact is expected.</p> <p>Proposed access track would impact on culvert located in Survey Area No. 4-26, but not on pipeline, as it is below the ground in this area.</p> <p>Proposed drainage works to the south of the pipeline would impact on culvert located in Survey Area No. 4-27.</p>

Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
			A second concrete drainage channel 500 m in length along the southern perimeter of the 1940s pipeline, to the east of The Northern Road.	While there is a physical impact on the culvert, there is not impact on heritage significance.
Item 9	Miss Lawson's Guesthouse Site	-	Construction of dual carriageway, intersection and cut slopes	The full site would be directly impacted by construction
Item 10	Lawson's Inn site	53 (LLEP)	Construction of dual carriageway, a cul-de-sac, an intersection, cut slopes and construction compound and laydown site	Around a quarter of the site would be directly impacted by construction

## 7. Statements of heritage impact

The implementation of the general and site-specific mitigation measures listed below would minimise impacts on non-Aboriginal heritage to an acceptable level to proceed with the project as assessed.

### 7.1 Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (Lot 3 DP238092)

#### Proposed works

Proposed works that would interact with the Orchard Hills Cumberland Plain Woodland CHP include clearing of vegetation and construction of a carriageway to the east of the existing The Northern Road, including associated fill slope formations and alterations to existing drainage lines for road-serving drainage and flood retardation works. This would have potential impacts on the natural heritage values of the site (refer to **Figure 7-1**). These works would also overlap with the western-most section of the Chaffey Brothers Irrigation Scheme Canal (the canal) in two locations, which would have potential impacts on the non-Aboriginal heritage values of the site (**Figure 7-2**).

#### Impact Assessment

Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values of the site through native vegetation removal and associated habitat loss, as well as impacts to the historic heritage values of the site as a result of impacts to the Chaffey Brothers Irrigation Scheme Canal (the canal). These potential impacts are summarised below.

*The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:*

The natural heritage values of the site are mainly focused on its natural vegetation, which includes areas of original native vegetation (including very old relic trees) as well as the natural regrowth of these original plant communities (Godden Mackay Logan (2013)). This includes small remnants and regenerating areas of Cumberland Plain Woodland, Castlereagh Ironbark Forest and Sydney Coastal Riverflat Forest (River Flat Eucalypt Forest), particularly in the eastern portion of the CHP. It is noted that impacts from the project would be limited to the western periphery of the CHP.

Cumberland Plain Woodland is listed as a critically endangered ecological community at both state (*Cumberland Plain Woodland in the Sydney Basin Bioregion*) and Commonwealth levels (*Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*). As such, the CHP is considered a core biodiversity area for the conservation of these communities, and the place comprises the least disturbed and largest remaining remnant of Cumberland Plain Woodland (Godden Mackay Logan 2013).

Although around 9.68 ha of native vegetation would be removed by the project, this is equivalent to only around 1.3% of the 726.32 ha of native vegetation on the CHP. These areas are made up of a mix of regrowth natural vegetation communities identified in the HMP as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). There is also a small patch of relic native trees associated with two trees located within the north-western portion of the CHP that would also be impacted by the project. This area is identified as having moderate natural heritage significance (Godden Mackay Logan 2013).

Additionally of the 9.15 ha of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (CPWSGTF) and River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (REFCF) ecological communities that would be removed by the project, this would be equivalent to only around 1.5% of the total 610.60 ha of these communities within the CHP. None of the areas impacted by the project have been identified in the HMP as remnant vegetation communities of high natural heritage value.



Additionally since the area is already disturbed by fencing, roadside and edge effects, impacts to fauna within the CHP as a result of the project (eg edge effects, light pollution, etc.) are not considered to be significant. For impacts to fauna refer to the Biodiversity Assessment (Appendix I of the EIS).

The project would also result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour potential along these drainage lines would increase and ground conditions would become wetter. However, these impacts are not expected to extend to the aquatic areas mapped as moderate to high significance within the CHP, therefore the impact on these areas would be negligible. This is due to the distance of the works from these areas and the implementation of effective mitigation measures outlined in the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).

The entire length of the canal within the CHP is around 2,632 m and is ranked as being of high significance in the HMP (Godden Mackay Logan 2013). There would be minimal impact to the canal as much of its extent is situated outside the construction footprint. The construction footprint (and therefore, area of impact) only overlaps with around 2.43 % of the entire canal. Furthermore, around 36 m of the part of the canal located within the construction footprint is in poor condition as it is extremely shallow from erosion. The section within the construction footprint which is in better condition is very similar to those sections that are outside the construction footprint. The wooden features of the canal structure that have the potential to yield information about the construction of the canal are located outside the construction footprint.

*The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:*

As identified above, although around 9.68 ha of native vegetation would be removed by the project, this is equivalent to only around 1.3% of the 726.32 ha of native vegetation on the CHP and is mainly made up of a mix of regrowth natural vegetation communities identified in the HMP as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). The small patch of relic native trees within the north-western portion of the CHP that would also be impacted by the project, which has been identified as having moderate natural heritage significance (Godden Mackay Logan 2013).

The key attributes of natural heritage elements on DEOH are the floristics and structure of the ecological communities, and the existence of the isolated relic trees. Therefore, they have different levels of tolerance for change. The regrowth natural vegetation communities have been identified as having a reasonable tolerance for change, being that this element and its key attributes have relatively little heritage value, but may contribute to the overall significance of the site. In general, the element can be altered to a reasonable degree provided it does not impact the heritage values of the site (Godden Mackay Logan 2013). In the context of the CHP overall, impacts to regrowth natural vegetation communities as well as grasslands are expected to be minimal and are therefore considered reasonable. Given this and the moderate to low heritage significance of these elements, impacts as a result of the project are not expected to be significant.

Relic native trees have been identified as having a low tolerance for change, being that this element and its key attributes embody heritage values, retaining a high degree of intactness with no major change or alterations, or only minor alterations that do not detract from the heritage values. In general, the element should be retained and conserved (Godden Mackay Logan 2013). Although impacts to relic native trees in the overall context of the CHP as a result of the project would be minimal, given their moderate natural heritage significance and low tolerance for change, impacts to this element as a result of the project are considered moderate.

The project could potentially introduce invasive weed and pest species. There may be regular mobilisation of typical roadside maintenance fertilisers, herbicides or other chemicals that may stunt the regrowth of native vegetation. However this would be managed through the implementation of effective weed and pest management measures as outline in the Biodiversity Assessment (Appendix I of the EIS).

The project would result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour

potential along these drainage lines would increase and ground conditions would become wetter. However as identified above, impacts to the aquatic areas mapped as moderate to high significance in the DEOH site would be negligible due to the distance of the works from these areas and the implementation of effective mitigation measures.

In relation to the canal, which is ranked as being of high significance in the HMP (Godden Mackay Logan 2013), only 2.43 % of the entire canal extent associated with the DEOH is situated within the construction footprint and would therefore be subject to direct physical impact during construction. The remaining sections of the canal within the study area would potentially be subject to damage or destruction from the use of construction machinery and vehicles if not managed appropriately during construction; however this is not expected given the implementation of mitigation measures as outlined in **Section 8.1**.

Around 36 m of the canal within the construction footprint area is extremely shallow and eroded while the more intact section is similar to the other sections which would not be impacted, therefore it has limited potential to yield information just from that section. Overall the proposed works would have minimal impact to the significance of the site.

Furthermore, there are other remnants of the canal located to the west of The Northern Road about one kilometre south-west of the DEOH site which is listed on the PLEP as a locally significant archaeological heritage item (A-137).

The following impacts have been assessed as follows:

- vibration – vibration is unlikely to impact the canal due to the structural nature of the canal and vegetation on the canal
- demolition – around 2.43 % of the canal extent associated with DEOH overlaps with the construction footprint and would likely be demolished. The remaining section of the canal outside the construction footprint is not expected to be impacted.
- archaeological disturbance – the section of the canal that would be impacted is similar to the other sections of the canal which would not be impacted and would not yield any additional information
- altered historical arrangements and access – the canal is located on Defence land and is therefore subject to restricted access
- landscape and vistas – the landscape within the project would be altered by the construction of the dual carriageway; however, the vistas of the area would not be impacted as part of the area contains trees which obscure the vistas of the canal
- architectural noise treatment – not relevant to this heritage item

The Heritage Management Plan for the DEOH site (Godden Mackay Logan 2013:152-155) outlines management guidelines for the DEOH, including those related to managing impacts to the natural heritage values within Sectors B and H and historic heritage values associated with the canal in Sector H as follows:

- This New development in Sectors B and H should be located so as to avoid impacts on natural heritage. These sectors have a low tolerance for change in relation to new development
- New development in Sector H should not be planned for the southwest area where the Mulgoa Irrigation Scheme (the canal) is located. This southwest area of Sector H has a low tolerance for change in relation to new development.
- Demolition and remediation relating to whole of DEOH land – Remediation should aim to avoid all heritage items and values. If heritage sites cannot be avoided as a consequence of remediation, then heritage mitigation measures should be implemented. Remediation that impacts heritage values must be subject to assessment, development of a HIA, heritage impact mitigation and Defence approval.
- Demolition and remediation relating to Sector H (location of canal) - consideration of proposals for demolition of built elements should take into account the heritage value of the element and its tolerance for change, as well as its relationship to other, related elements of heritage value and the number of its type

remaining. Demolition of elements of moderate and high heritage value should be avoided. Sector H has a low tolerance for change.

As discussed above, some impacts would occur as a result of the project which are unavoidable. Additionally, given the project is impacting a small proportion of the overall canal on DEOH land, and that the section being impacted is of relatively poor quality due to erosion, the overall impact on the heritage values are not considered to be significant.

However by implementing the relevant mitigation measures identified in the Biodiversity Assessment (Appendix I of the EIS), the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS), impacts to the natural heritage values of the site are expected to be minimised and are not expected to be significant.

By implementing the following mitigation measures the potential impacts on the canal would be minimised:

- An archival photographic recording would be made of the extent of the canal to be impacted by the works, in accordance with the Heritage Division of the OEH guidelines (Heritage Council of NSW 2006) prior to its demolition
- The section of the canal outside the construction footprint would need to be protected from accidental or incidental damage during construction. Protective barrier fencing would be constructed along the construction footprint boundary in the vicinity of the canal prior to construction commencing and would remain in place until the conclusion of the works, at which time it would be removed.

Implementing these mitigation measures would reduce the impact of the significance of the canal as much as possible given the other constraints in this area of the project.

Additionally, given the project is impacting a small proportion of the overall canal on DEOH land, and that the section being impacted is of relatively poor quality due to erosion, the overall impact on the heritage values are not considered to be significant.

In summary, the project is not expected to have a significant impact on the natural or non-Aboriginal heritage values of the CHP given the heritage significance of these elements, their tolerance for change and proposed implementation of effective mitigation measures in accordance with this assessment (Section 8.1), the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).

By implementing the following mitigation measures the potential impacts on the canal would be minimised:

- An archival photographic recording would be made of the extent of the canal to be impacted by the works, in accordance with the Heritage Division of the OEH guidelines (Heritage Council of NSW 2006) prior to its demolition
- The section of the canal outside the construction footprint would need to be protected from accidental or incidental damage during construction. Protective barrier fencing would be constructed along the construction footprint boundary in the vicinity of the canal prior to construction commencing and would remain in place until the conclusion of the works, at which time it would be removed.

Implementing these mitigation measures would reduce the impact of the significance of the canal as much as possible given the other constraints in this area of the project.

In summary, the project is not expected to have a significant impact on the natural or non-Aboriginal heritage values of the CHP given the heritage significance of these elements, their tolerance for change and proposed implementation of effective mitigation measures in accordance with this assessment (Section 8.1), the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).

The Significant Impact Guidelines 1.2 (Department of Sustainability Environment Water Population and Communities 2013) (SEWPac) provides a list of criteria that guide the assessment of actions that are likely to have a significant impact on the environment. These are relevant to the project for identifying the significance of potential impacts to the heritage values of the Orchard Hills Cumberland Plain Woodland CHP, as provided in **Table 7-1**. It is suggested in SEWPac (2013) that where the answer to any of these questions is yes, a significant impact on the environment would be expected.



Where the project does not incur significant impacts to natural heritage values, a referral for the project to undergo further assessment by the Federal Department of the Environment is not required and, subsequently, the need to obtain offsets specific to natural heritage values is also not required. This is separate to the requirement for a referral under the EPBC Act due to biodiversity impacts, which has been assessed in the Biodiversity Assessment for the project (Appendix I of the EIS).

Table 7-1 : Item 2 – significant impact assessment

Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
<p>Permanently destroy, remove or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place</p>	<p>Approximately 9.68 ha of native vegetation would be removed by the project within the construction footprint. This is equivalent to 1.3% of the 726.32 ha of native vegetation on the CHP.</p> <p>Approximately 9.15 ha of the CPWSGTF and REFCF ecological communities would be removed by the project at the western edge of the CHP. The total area of these communities on the CHP is 610.60 ha. As such, the area removed would be equivalent to 1.5% of the total amount within the CHP. Using the severity guidelines provided in SEWPaC (2013), the Project is a Moderate severity impact. The action would permanently remove some of the components upon which the Orchard Hills Cumberland Plain Woodland CHP is based.</p> <p>However, of the impacted areas, none are identified as remnant vegetation communities which are ranked as high heritage significance (Godden Mackay Logan 2013), but rather would be limited to regrowth natural vegetation communities and a small patch of relic native trees ranked as moderate heritage significance in the HMP (Godden Mackay Logan 2013). In summary, the core vegetation areas in the centre and east of the Orchard Hills Cumberland Plain Woodland would not be affected, therefore impacts to the natural heritage values of the site as a result of vegetation loss are not expected to be significant.</p> <p>Construction of the project involves small scale native vegetation clearance that could potentially introduce invasive weed and pest species. There may be regular mobilisation of typical roadside maintenance fertilisers, herbicides or other chemicals that may stunt the regrowth of native vegetation. However this would be managed through the implementation of effective weed and pest management measures as outline in the Biodiversity Assessment (Appendix I of the EIS).</p> <p>Additionally since the area is already disturbed by fencing,</p>	<p>The proposed action would involve the demolition of a small section of the canal, which would permanently destroy, remove or substantially alter the fabric of the canal. However, an archival photographic recording would be undertaken for the entire canal to capture detailed information that has not previously been captured of a heritage item subject to ongoing environmental erosion.</p>

Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
	<p>roadside and edge effects, the impact to fauna as a result of the project (eg edge effects, light pollution, etc.) is not considered to be significant.</p> <p>The project would also result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour potential along these drainage lines would increase and ground conditions would become wetter. However, these impacts are not expected to extend to the aquatic areas mapped as moderate to high significance within the DEOH site, therefore the impact on these areas would be negligible. This is due to the distance of the works from these areas and the implementation of effective mitigation measures outlined in the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).</p> <p>The impact would be intense, involving vegetation removal and construction of a road. The impact would be permanent and irreversible. However the scale of the impact to the CHP is relatively small (considering the 610.60 ha area of the CPWSGTF and REFCF ecological communities on the CHP site) as the project impacts are limited to the vegetation on the western fringes, and the core biodiversity area for conservation which has been identified as high heritage significance in the HMP (Godden Mackay Logan 2013), would not be impacted.</p> <p>As such, this criteria is expected to be consistent with the heritage values of the CHP where mitigation measures are implemented.</p>	
Involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place	The project would result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour potential along these drainage lines would increase and ground conditions would become wetter. This does	The heritage values of the place relate to potential to yield information about early canal/irrigation practices and construction which can be obtained from the wooden structures and canal located outside the impact area. The historical significance would not be affected as the majority of the canal would not be affected

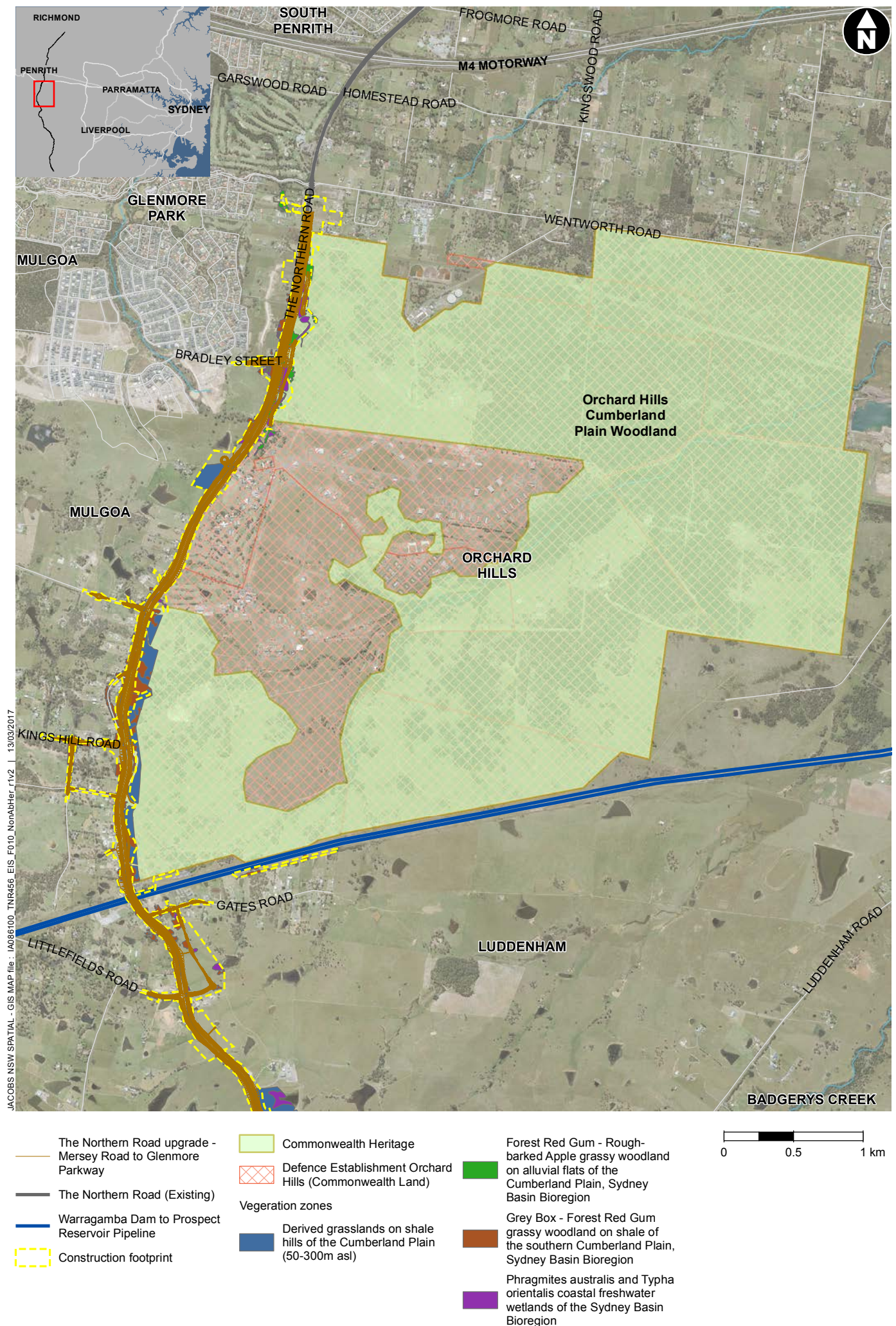


Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
	<p>not accord with the heritage values of the CHP. However, these impacts are not expected to extend to the aquatic areas mapped as moderate to high significance within the DEOH site, therefore the impact on these areas would be negligible. This is due to the distance of the works from these areas and the implementation of effective mitigation measures outlined in the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS). This would take account of the DEOH Land Remediation Plan and Soil Conservation Manual to take account of the natural at the CHP.</p> <p>Exposure of soils resulting from vegetation clearing and other earth works would create an opportunity for weed invasion which has the potential to be moderately severe in this type of environment due to medium-long term impacts of a small-medium scale. However, this impact would be minimised through the implementation of effective weed and pest management measures as outline in the Biodiversity Assessment (Appendix I of the EIS), which would incorporate relevant elements of the DEOH Weed Management Plan.</p> <p>The native vegetation removal has the potential to limit habitat opportunities and ecological function for native flora and fauna. This is not in accordance with the heritage values of the CHP. However, being that the vegetation loss is of a small area of low to moderate significance (Godden Mackay Logan 2013) and is spread in a linear fashion along an existing habitat edge, this impact is not considered to be significant, being of a small-scale/localised and low-intensity nature.</p> <p>As such, this criteria is expected to be consistent with the heritage values of the CHP where mitigation measures are implemented.</p>	<p>and an archival photographic recording would be undertaken for the entire canal thereby capturing information about the heritage item in detail.</p>
Involve the erection of buildings or other structures adjacent to, or within	The Project involves the construction of an (up to) eight-lane road corridor at the western periphery of the CHP. According to	Unlikely. The proposed action would involve the demolition of a small section of the canal which is unlikely to result in visual

Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
important sight lines of, a heritage place which are inconsistent with the heritage values of the place	<p>observations made during the biodiversity survey, the existing The Northern Road is likely to be visible from high points within the CHP. The Project alignment is similar to that of the existing roadway and, as such the vistas from the CHP are not anticipated to be substantially changed.</p> <p>This criterion is considered to be consistent with the current heritage values of the CHP.</p>	impacts on the remainder of the canal.
Substantially diminish the heritage value of a heritage place for a community or group for which it's significant	<p>The CHP holds heritage value to a range of community groups, such as the Friends of the Cumberland Plains and the Department of Defence. However, the impact to the CHP is considered to be relatively small, involving the clearance of 0.67% of the available extent of CPWSGTF and REFCF ecological communities within the CHP site that is already disturbed by edge effects relating to the current The Northern Road corridor. Additionally these have been identified as native regrowth areas of low to moderate significance with a reasonable tolerance for change (Godden Mackay Logan 2013). This is not considered to be a significant reduction in the heritage value of the CHP for community groups.</p> <p>As such, this criteria is expected to be consistent with the heritage values of the CHP where mitigation measures are implemented.</p>	The significance assessment for the canal does not provide values for a strong or special association with any particular community group or cultural group associated with the canal.
Substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place	<p>The Project would involve the loss of a relatively small area (0.67%) of the CHP. In the context of the CHP, this is not considered to be a substantial loss. Additionally these have been identified as native regrowth areas of moderate significance with a reasonable tolerance for change (Godden Mackay Logan 2013). The current setting includes the existing The Northern Road corridor. The Project would result in the widening of this corridor with a similar alignment. As such, the Project is not considered to substantially alter the setting of the existing CHP that would be inconsistent with the heritage values of the CHP.</p> <p>As such, this criteria is expected to be consistent with the</p>	Unlikely. The proposed action would involve the demolition of a small section of the canal which is unlikely to substantially alter the setting of the heritage place.

Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
	heritage values of the CHP where mitigation measures are implemented.	
Substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site	Being that the CHP is currently used as an active Defence base and is restricted from public access, the Project is not anticipated to result in the CHP being more restricted as a cultural site. No ceremonial sites are present within the CHP site. This criterion is considered to be consistent with the current heritage values of the CHP.	No impact. The heritage place is not used as a cultural or ceremonial site.





**Figure 7-1** | Location of Orchard Hills Cumberland Plain Woodland (Item 2) in relation to proposed works





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**Figure 7-2** | Location of Chaffey Brothers Irrigation Scheme Canal (Item 2) in relation to proposed works



## 7.2 Item 3: Warragamba Dam to Prospect Reservoir pipeline (Lot A DP341629 & Lot A DP341893)

### Proposed works

Construction of carriageway and fill slope to the west of The Northern Road (current) overlaps with the pipeline alignment to the west of The Northern Road (**Figure 7-3**).

### Impact assessment

*The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:*

The carriageway is located over the section of pipeline that is below the ground to the west of The Northern Road and would avoid direct impact to the pipeline. In addition the proposed works include fill slopes within the pipeline corridor.

*The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:*

Potential for physical damage to the pipeline from road construction machinery, vehicles or other activities accidentally occurring outside the construction footprint. However, measures outlined in *The Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines* (Sydney Catchment Authority 2012) sets out guidelines when designing, planning or assessing development on land adjacent to this pipeline. The document outlines risks to the pipeline through construction works in the vicinity. A Construction Environmental Management Plan is recommended for major development projects (Sydney Catchment Authority 2012:9).

The two concrete culverts located within a proposed access track and drainage works area would be directly impacted by the proposed works. However, removal of the culverts would not impact on the significance of the pipeline because they do not contribute to the historical significance of the site, nor demonstrate the technological significance of the pipeline. By following the mitigation measures as much information as possible can be preserved which contributes to our knowledge and significance of the heritage item.

The following impacts have been assessed as follows:

- vibration – unlikely due to the application of the measures outlined in *The Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines* (Sydney Catchment Authority 2012) and the guidelines and associated safe working distances to be adhered to for heritage structures as outlined in the Noise and vibration assessment (**Appendix H** of the EIS)
- demolition – the pipeline would not be demolished. The two concrete culverts would be demolished and would not impact on the significance of the heritage item
- archaeological disturbance – not applicable
- altered historical arrangements and access – the heritage item is located within WaterNSW land and is therefore subject to restricted access
- landscape and vistas – the landscape and vistas of the heritage item would not be impacted
- architectural noise treatment – not relevant to this heritage item

There would be no overall impact to Item 3 during construction.

There would be no operational impacts to Item 3.





**Figure 7-3** | Location of Warragamba Dam to Prospect Reservoir Pipeline (Item 3) in relation to proposed works

### 7.3 Item 9: Miss Lawson's Guesthouse site (Lot 1 DP90157)

#### Proposed works

- Construction of dual carriageway and cut slopes
- Construction of an intersection off the new The Northern Road onto Eaton Road (**Figure 7-4**).

#### Impact assessment

*The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:*

While the project would have a direct impact on archaeological deposits of the Guesthouse site, the opportunity for undertaking a detailed archaeological investigation of the site prior to its destruction may enhance its significance through the realisation of its research potential. Undertaking archaeological investigation of the site under a well-structured research design by an appropriately qualified historical archaeologist would reveal information and answer questions particularly in relation to the early settlement of Luddenham and the hotel and inn industry in the early 20<sup>th</sup> century.

*The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:*

The construction of The Northern Road upgrade would have a direct impact on all surface features identified at the site, and on potential subsurface archaeological deposits from the construction. By following the mitigation measures as much information as possible can be obtained which contributes to our knowledge and significance of the heritage item. To minimise impacts and maximise the opportunity for realising research potential at the site the following actions would be undertaken:

- Archaeological investigation in the form of salvage excavation to be undertaken in accordance with the Heritage Division of OEH guidelines including an appropriate research design and methodology in order to best realise the research potential of this area of the site
- Archaeological investigation in the form of salvage excavation would be undertaken under the supervision of an appropriately qualified and experienced historical archaeologist in accordance with the Heritage Division of OEH criteria.

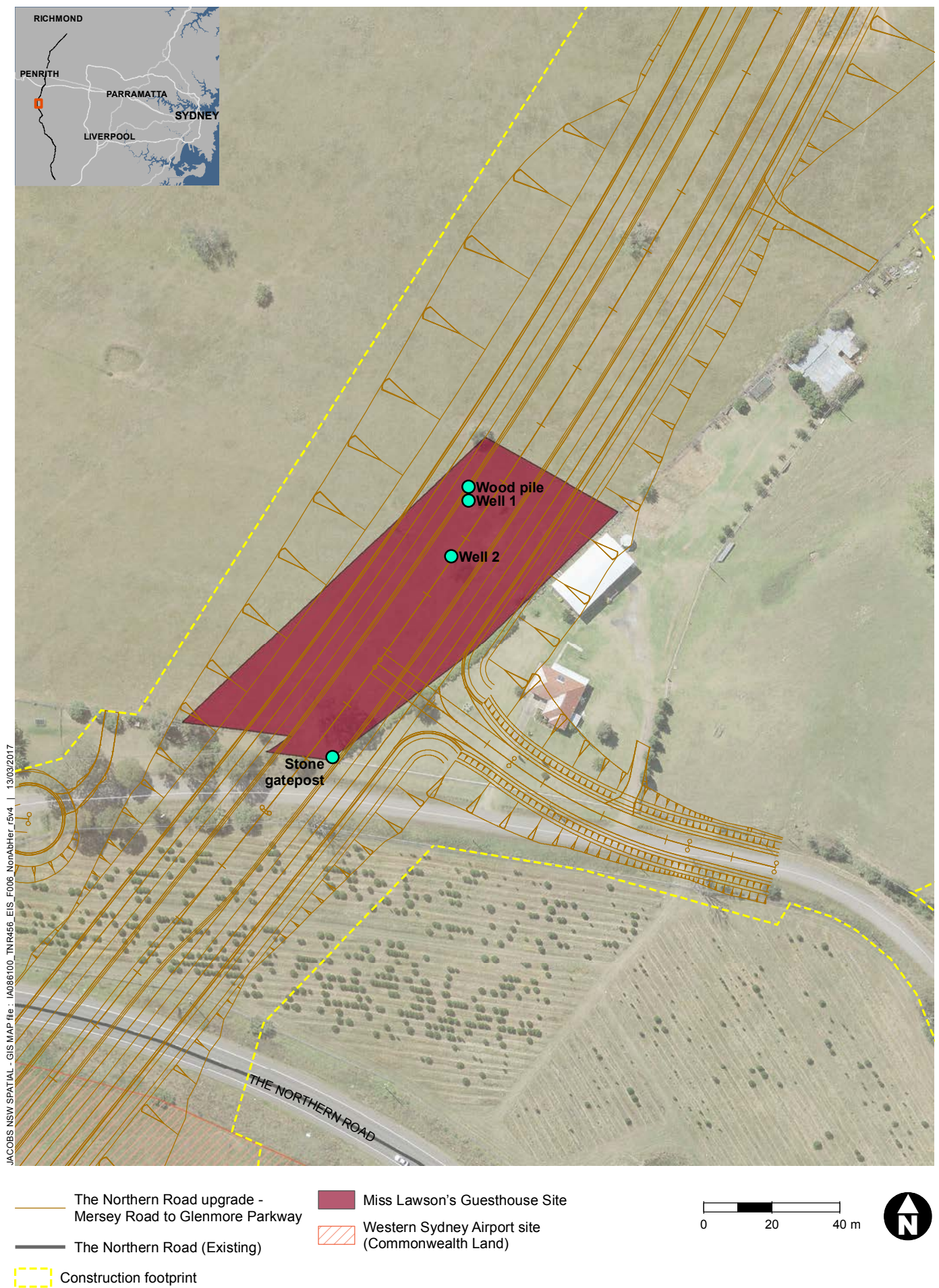
The following impacts have been assessed as follows:

- vibration – this heritage item would not be impacted by vibration due to the archaeological nature of the site
- demolition – the entire heritage item would be demolished; however, mitigation measures would minimise these impacts
- archaeological disturbance – the entire heritage item would be subject to archaeological disturbance; however, mitigation measures would minimise these impacts
- altered historical arrangements and access – not relevant to this heritage item, as the entire site would be impacted
- landscape and vistas – Not relevant to this heritage item
- architectural noise treatment – not relevant to this heritage item

Construction impacts to Item 9 would be physical damage to the whole site.

There would be no operational impacts to Item 9.





**Figure 7-4** | Location of Miss Lawson's Guesthouse Site (Item 9) in relation to proposed works



## 7.4 Item 10: Lawson's Inn Site (Lot 2 DP623457) (LLEP 53)

### Proposed works

- Construction of new dual carriageway (The Northern Road)
- Construction of a cul-de-sac on the existing Eaton Road, to the west of the new The Northern Road. The southern section of the cul-de-sac extends into the inn site
- construction of an intersection off the new The Northern Road onto Eaton Road
- Cut slopes for all of the above
- Construction compound and laydown site (**Figure 7-5**)

### Impact assessment

*The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:*

While the project would have a direct impact on archaeological deposits of the inn, the opportunity for undertaking a detailed archaeological investigation of the site prior to its destruction may enhance its significance through the realisation of its research potential. Undertaking archaeological investigation of the site under a well-structured research design by an appropriately qualified historical archaeologist would reveal information and answer questions particularly in relation to the early settlement of Luddenham, and the hotel and inn industry related to use of early roads in NSW.

*The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:*

The construction of The Northern Road upgrade would directly impact on the entire curtilage of the site, including the potential archaeological deposits. By following the mitigation measures as much information as possible can be obtained which contributes to our knowledge and significance of the heritage item. To minimise impacts and maximise the opportunity for realising research potential at the site the following actions would be undertaken:

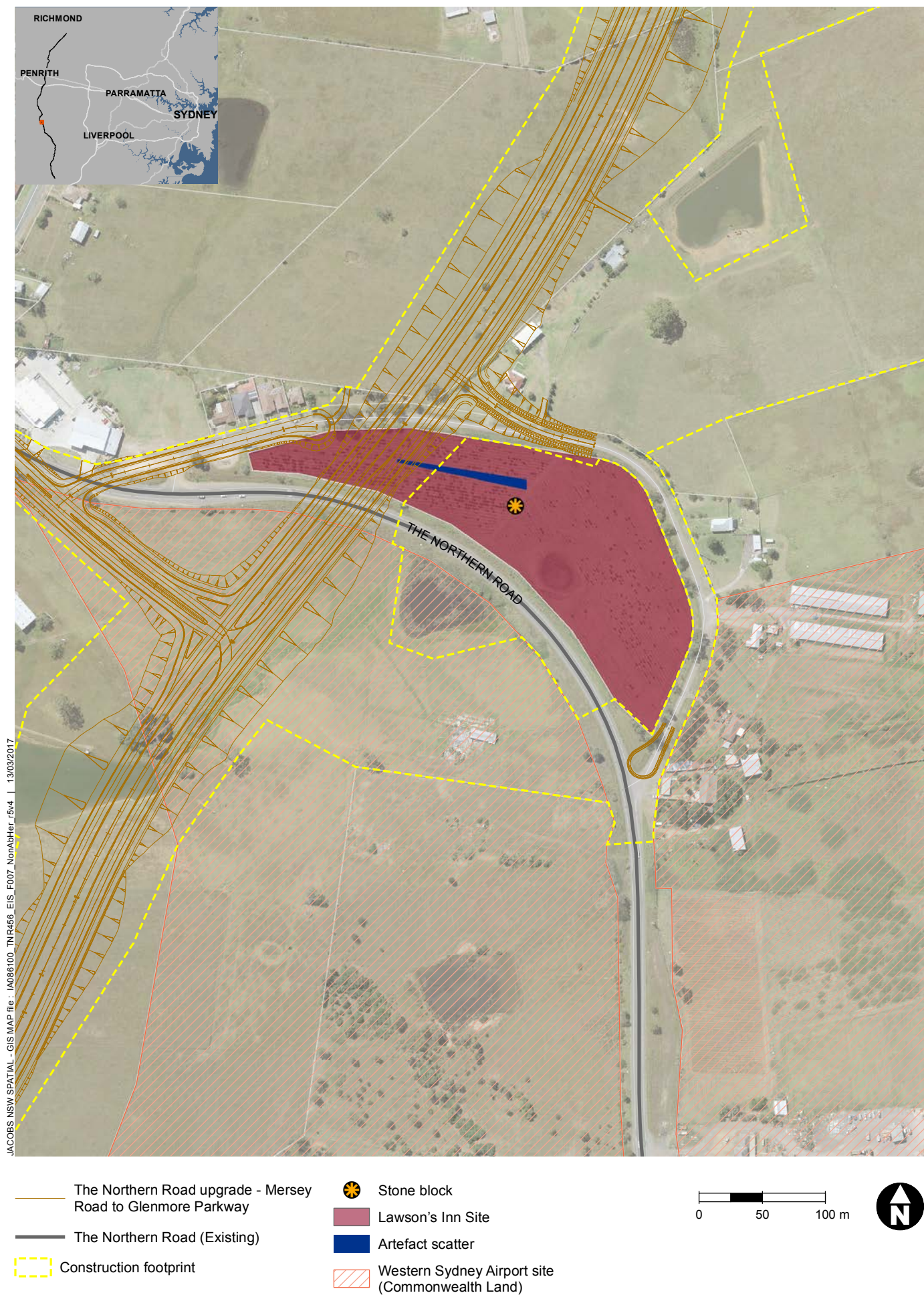
- Archaeological investigation in the form of salvage excavation to be undertaken in accordance with the Heritage Division of OEH guidelines including an appropriate research design and methodology in order to best realise the research potential of this area of the site
- Archaeological investigation in the form of salvage excavation would be undertaken under the supervision of an appropriately qualified and experienced historical archaeologist in accordance with the Heritage Division of OEH criteria.

The following impacts have been assessed as follows:

- vibration – this heritage item would not be impacted by vibration due to the archaeological nature of the site
- demolition – part of this heritage item would be demolished; however, mitigation measures would minimise these impacts
- archaeological disturbance – part of the heritage item would be subject to archaeological disturbance; however, mitigation measures would minimise these impacts
- altered historical arrangements and access – the historical arrangements and access would not change for the remaining part of the heritage item which would not be impacted
- landscape and vistas – not relevant to this heritage item
- architectural noise treatment – not relevant to this heritage item

Construction impacts to Item 10 would be physical damage to part of the site.

There would be no operational impacts to Item 10.



**Figure 7-5** | Location of Lawson's Inn Site (Item 10) in relation to proposed works

## 7.5 Residual impacts

The following assessment of residual impacts identifies the level of impact to non-Aboriginal heritage without implementation of the proposed mitigation measures, and the level of impact with the implementation of the proposed mitigation measures, for each heritage item potentially impacted by the project.

The criteria used in the assessment of residual impacts to heritage is shown in **Table 7-2** below. Additionally the assessment of residual impacts to natural heritage is based on the impact severity criteria provided in the Significant Impact Guidelines 1.2 (SEWPaC 2013).

The assessment of residual impacts during construction and operation of the project is shown in **Table 7-3** below. Additional detail on the measures to mitigate impacts to biodiversity-related natural heritage values can be found in the project Biodiversity Assessment Report (Jacobs 2017).

Table 7-2 : Impact rating criteria

Level of Impact	Consequence
Negligible	No impact to non-Aboriginal heritage item
Low	Partial disturbance, damage or removal of non-Aboriginal material, fabric or objects from a heritage item / minor reduction in heritage significance
Medium	Disturbance, damage or removal of up to half of a heritage item / moderate reduction in heritage significance
High	Complete disturbance, damage or removal of a non-Aboriginal heritage item / complete reduction in heritage significance



Table 7-3 : Residual impacts during construction and operation of the project

Heritage item name	Potential impacts during construction	Impact	Proposed mitigation	Impact after mitigation	Potential impacts during operation	Impact during operation
Orchard Hills Cumberland Plain Woodland	<p>Clearing of native vegetation (9.15 ha), including regrowth areas of critically endangered ecological communities</p> <p>Changed hydrological conditions within the Blaxland Creek catchment</p>	<p>Low to medium. Clearing impacts would be permanent, irreversible and intense, however these impacts would be limited to areas ranked as low to moderate significance in the HMP for the DEOH (Godden Mackay Logan 2013)</p> <p>Negligible. Increased volume and rate of flow discharged to waterways, increased scour, erosion and sedimentation along waterways and wetter ground conditions. However these would not impact areas ranked as moderate to high significance in the HMP for the DEOH (Godden Mackay Logan 2013)</p>	Relevant mitigation measures as per the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS) would be implemented to appropriately manage potential impacts to the natural heritage values of the site.	<p>Minor (or negligible) changed hydrological conditions within the Blaxland Creek catchment,</p> <p>Minor (or negligible) weed and pathogen impacts</p> <p>Minor light impacts to fauna</p>	<p>Moderate. Changed hydrological conditions within the Blaxland Creek catchment</p> <p>Degradation of ecological condition by proliferation of weed species at the CHP</p> <p>Light pollution due to increased road lighting</p>	Relevant mitigation measures as per the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS) would be implemented to appropriately manage potential impacts to the natural heritage values of the site.

Heritage item name	Potential impacts during construction	Impact	Proposed mitigation	Impact after mitigation	Potential impacts during operation	Impact during operation
	Degradation of ecological condition by proliferation of weed species	Low. Weed invasion degrades biodiversity values				
	Introduction / disturbance of pathogen and/or disease vectors	Low. Pathogens and disease presence to be tested / confirmed. Impact includes degradation of ecological resources.				
	Light pollution	Low. Light impact includes habitat unsuitability for some native fauna				
	Physical damage to northern section of canal adjacent to The Northern Road	Low. Only small section of overall canal system would be removed.	Archival photographic recording of the canal and erection of protective barrier fencing	Recording of northern section of canal allows for interpretation and understanding of site even though partially destroyed.	No impact as operation would be confined to road which is located adjacent to remaining canal section.	Negligible. Traffic use of the road is located adjacent to the remaining canal and separated by fill slope.
Warragamba Dam to Prospect Reservoir pipeline	Potential for accidental impact	Low. Two concrete culverts would be impacted by the proposed works; however, neither of these contribute to the overall significance of the pipeline. The pipeline would not be impacted.	Follow measures outlined in <i>The Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines</i> (Sydney Catchment Authority 2012)	Negligible. Guidelines (Sydney Catchment Authority 2012) set out measures when designing, planning or assessing development on land adjacent to the pipeline.	No impact as Guidelines (Sydney Catchment Authority 2012) would be followed during operation.	Negligible. Guidelines (Sydney Catchment Authority 2012) would be followed during operation.

Heritage item name	Potential impacts during construction	Impact	Proposed mitigation	Impact after mitigation	Potential impacts during operation	Impact during operation
Miss Lawson's guesthouse site	Physical impact to entire site	High. The construction would have a direct impact on all surface features identified at the site and on potential subsurface archaeological deposits.	Detailed salvage archaeological investigation of the site	Medium. Salvage excavation allows for data to be collected about the site which contributes to our knowledge and understanding of site	No impact as site would have been removed through salvage excavation and subsequent construction.	Negligible as site would have been removed through salvage excavation and subsequent construction.
Lawson's Inn site	Physical impact to part of the site	High The construction would directly impact on the potential archaeological deposits of the site.	Detailed salvage archaeological investigation of the site	Medium. Salvage excavation allows for data to be collected about the site which contributes to our knowledge and understanding of site	No impact as site would have been removed through salvage excavation and subsequent construction.	Negligible as site would have been removed through salvage excavation and subsequent construction.



## 8. Conclusion

### 8.1 Site-specific mitigation measures

A construction heritage management plan would be prepared as part of the CEMP prior to construction in consultation with the NSW Heritage Division of OEH. As a minimum, the plan would include the following:

- Induction protocols for staff and project personnel to undertake a cultural heritage induction, to assist them in understanding and complying with their legal obligations under the Heritage Act 1977
- A list, plan and GIS layer showing the location of identified heritage items
- A significance assessment and statement of significance for each item
- Detail the mitigation measures identified and when the measures are to be implemented
- Provide protocols and procedures to be enacted during construction to ensure the protection of items of heritage significance
- An unexpected finds procedure in the event that further sites are identified during works
- The separate procedure for the discovery of skeletal remains (highly effective).

A summary of the mitigation measures discussed above in Impact Assessment (**Section 7**) are provided in **Table 8-1**.

Table 8-1 : Mitigation measures for non-Aboriginal heritage items.

Heritage item name	Number (if applicable)	Potential impacts	Mitigation measures
Orchard Hills Cumberland Plain Woodland	CHL 105317 RNE 102211	<p>Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values and impacts to the historic heritage values of the site as summarised below:</p> <p>Natural heritage impacts would be related to:</p> <ul style="list-style-type: none"> <li>• Clearing of around 9.68 ha of moderate to low significance native vegetation within the western periphery of the CHP including two relic trees located within the north-western portion of the CHP</li> <li>• The regrowth natural vegetation communities impacted have been identified as having a reasonable tolerance for change, while the relic trees have a low tolerance for change</li> <li>• Additional potential impacts to natural heritage values may include degradation of ecological condition by proliferation of weed species at the CHP, Introduction / disturbance of pathogen and/or disease vectors and indirect impacts to fauna from light pollution (construction and operation).</li> </ul> <p>Historic heritage impacts would be related to:</p> <ul style="list-style-type: none"> <li>• Impacts to historic heritage as a result of physical damage to northern section of canal adjacent to The Northern Road, located within the south-western portion of the CHP.</li> </ul>	<ul style="list-style-type: none"> <li>• Relevant mitigation measures as per the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS) would be implemented to appropriately manage potential impacts to the natural heritage values of the site</li> <li>• Archival photographic recording in accordance with the Heritage Division of the OEH guidelines. This would include: <ul style="list-style-type: none"> <li>- Report (paper), thumbnails, CD-R and prints (10.5x14.8cm) to NSW Heritage Office</li> <li>- Report (paper), thumbnails and CD-R to State Library of NSW</li> <li>- Report (paper), thumbnails and CD-R to Owner/client</li> <li>- Report (paper), thumbnails and CD-R to Local Council</li> <li>- Report (paper), thumbnails and CD-R to Local Council Library</li> </ul> </li> </ul>
Warragamba Dam to Prospect Reservoir pipeline	-	No impact	None required

Heritage item name	Number (if applicable)	Potential impacts	Mitigation measures
Miss Lawson's guesthouse site	-	Physical damage to entire site	Detailed salvage archaeological investigation of the site
Lawson's Inn site	LLEP 53	Physical damage to part of the site	Detailed salvage archaeological investigation of the site



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## Land records

173 (Litho) –surveyed April 1859

Roll Plan 4 – no apparent date

Indenture of Release (Conveyance) No. 27 Book 4 – 17<sup>th</sup> May 1843

Conveyance No. 70 Book 65 – 14<sup>th</sup> January 1860

Conveyance No. 132 Book 604 – 3<sup>rd</sup> August 1897

Conveyance No. 979 Book 1057 – 6<sup>th</sup> April 1915

Acknowledgment No. 62 Book 2040 – 18<sup>th</sup> November 1947

Conveyance No. 683 Book 2130 – 17<sup>th</sup> July 1950

Conveyance No. 21 Book 2555 – 27<sup>th</sup> September 1960